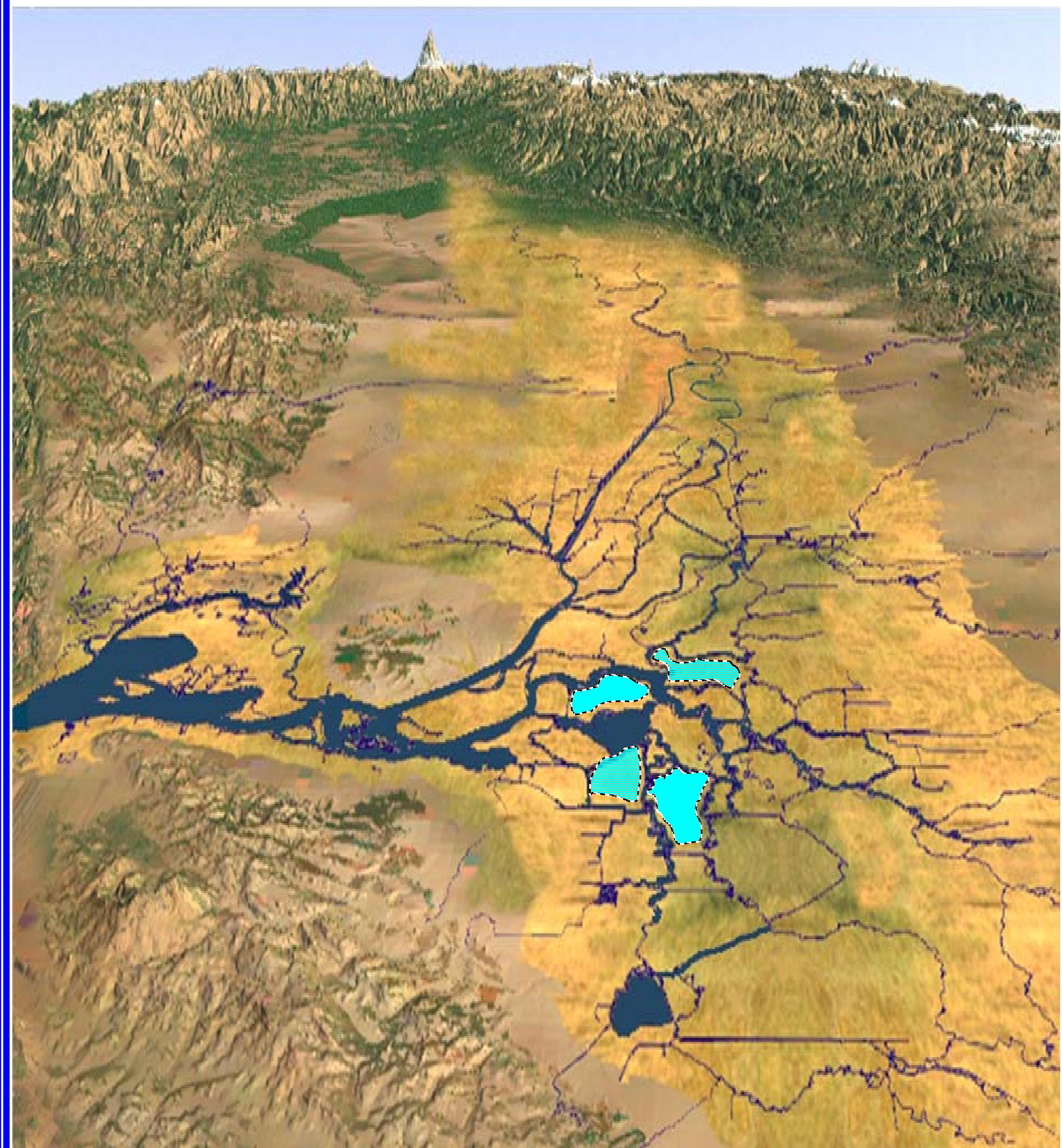
INTEGRATED STORAGE INVESTIGATIONS

# IN-DELTA STORAGE PROGRAM
# DRAFT REPORT ON WATER QUALITY INVESTIGATIONS



CALFED BAY-DELTA PROGRAM

May 2002

# ORGANIZATION

**State of California**
Gray Davis, Governor

**The Resources Agency**
Mary D. Nichols, Secretary for Resources

**CALFED**

Patrick Wright
Director

**Department of Water Resources**

Thomas M. Hannigan, Director
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L. Lucinda Chipponeri, Deputy Director
Peggy Bernardy, Chief Counsel
Naser Bateni, Chief
Div. of Planning and Local Assistance
Mark Cowin, Deputy Chief
Div. of Planning and Local Assistance

**U.S. Bureau of Reclamation***
**Mid-Pacific region**
Kirk Rodgers,
Regional Director
Susan Ramos,
Assistant Regional Director
Susan Hoffman,
Regional Planning Officer

***This report was prepared under the direction of***

**Division of Planning and Local Assistance**
Stephen S. Roberts, Chief
Surface Storage Investigations Branch
Tirath Pal Sandhu, Project Manager
In-Delta Storage Program

**With Major Contributions from**

**Water Quality Investigations Team**
Robert DuVall, Environmental Scientist, DWR
Paul Hutton, Chief, Delta Modeling Section, DWR
Ken Yokoyama, Hydraulic Engineer, Reclamation
Tara Smith, Senior Engineer, DWR
Michael Mierzwa, Engineer, DWR
Parviz Nader Tehrani, Senior Engineer, DWR
Sanjaya Seneviratne, Senior Engineer, DWR
Dan Easton, Engineer, DWR
Philip Wendt, Chief, Water Quality Assessment Branch, DWR
Dan Otis, Environmental Program Manager, DWR
Richard S. Breuer, Supervising Environmental Specialist, DWR

**Consultants**
Marvin Jung, Marvin Jung and Associates, Inc.
Charles Goldman, Ecological Research Associates
Marie Liu, Ecological Research Associates
Ted Swift, Ecological Research Associates

**Additional Technical Assistance Provided by**

**United States Bureau of Reclamation**
Allan Oto, Chief , Project Management Branch
David Lewis, Project Manager

**Metropolitan Water District of Southern California**
Richard Losee, Senior Limnologist
**Contra Costa Water District**
K.T. Shum, Senior Water Resource Specialist

*participation limited to technical assistance

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# Chapter 1 Executive Summary

## 1.1 General Introduction

The CALFED Bay-Delta Program was established in 1995 to develop a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The Integrated Storage Investigations Program was initiated by CALFED agencies in 1999 to support efforts towards meeting the goals defined under CALFED's comprehensive water management strategy. The plan entitled *"California's Water Future: A Framework for Action"* dated June 2000 states that one of CALFED's primary goals is to improve the reliability of California's water supply. The plan further states that development of new storage is an important component of the overall strategy to meet competing environmental and other water supply needs.

The CALFED Record of Decision (ROD) identified five surface storage projects: Enlarged Shasta, Los Vaqueros, Sites Reservoir, 250 to 700 TAF of additional storage in the upper San Joaquin River watershed and In-Delta Storage. The purpose of new storage in the Delta is to increase operational flexibility for the Central Valley Project (CVP) and the State Water Project (SWP) and provide ecosystem benefits in the Delta. The ROD included an option to explore the lease or purchase of the Delta Wetlands (DW) Project, a private proposal by DW Properties or to initiate a new project, in the event that DW Project proves cost prohibitive or infeasible.

A joint reconnaissance level study by the U. S. Bureau of Reclamation (Reclamation) and California Department of Water Resources (DWR) for the DW Project and alternatives, completed in September 2000, concluded that the In-Delta Storage Project would meet the goals of operational flexibility and provide other beneficial uses in the Delta.

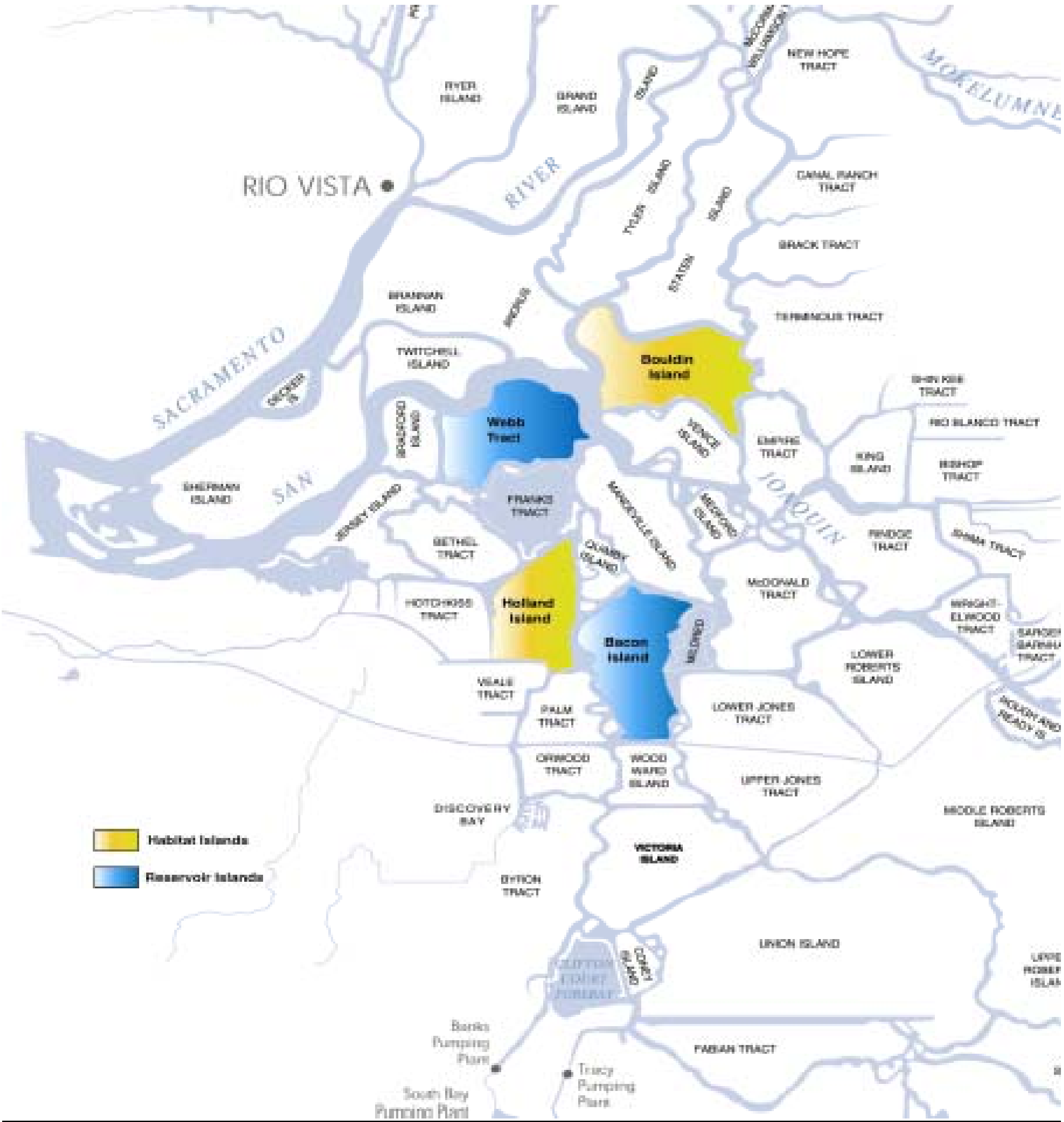
The participating agencies initiated a project study of the In-Delta Storage Project in January 2001. The project study included investigations related to operational flexibility, water quality, engineering, environmental, economic, and policy and legal evaluations. This water quality report presents information on four water quality studies that were done to assess the technical feasibility of the DW Project. The four studies are presented as separate chapters in this water quality report and include Water Quality Modeling Studies (Chapter 2), Water Quality Field Investigations (Chapter 3), Biological Productivity Studies (Chapter 4) and Temperature and dissolved oxygen (DO) Studies (Chapter 5).

## 1.2 DW Project Description

Federal and State entities would either lease or acquire the DW Project from DW Properties and would operate it in accordance with the terms and conditions of the Permit issued by the State Water Resources Control Board and all other permits, agreements, and limitations imposed on the project. The following is a brief discussion of the DW Project.  For a more detailed discussion see the In-Delta Storage Program Draft Report on Engineering Investigations.

DW Properties proposed a water storage and wetland project utilizing four islands in the Sacramento-San Joaquin Delta (Delta).  The project would divert and store water on two of the islands, Webb Tract and Bacon Island (reservoir islands) (Figure 1-1).  DW Properties would create or enhance wildlife habitat and wetlands on Holland Tract and Bouldin Island (habitat islands).  Water would be seasonally diverted onto the habitat islands to use for wildlife habitat and wetland creation, enhancement and management.

Figure 1-1. Proposed island usage under the DW Project



The project would primarily consist of:

- Improving and strengthening the levees of Webb Tract and Bacon Island to meet or exceed the criteria outlined in DWR Bulletin 192-82. Levee improvements would address erosion caused by wind and water waves action through placement of rock revetment on the slopes of the levees. The maximum water level in the storage reservoirs would not exceed +4 above mean sea level (MSL), providing a storage capacity of about 217 thousand acre-feet (TAF).

- Installing two new intake siphon stations along the perimeter of each reservoir island. Each station would incorporate 16 new 36-inch in diameter siphons. The rate of diversions would vary with pool elevation and water availability. The maximum rate of diversion onto either Webb Tract or Bacon Island would be 4,500 cubic feet per second (cfs) and the combined maximum daily rate of diversion onto all four islands, including diversions to habitat islands, would not exceed 9,000 cfs. The combined maximum monthly average rate of diversion would be 4,000 cfs.

- Installing drum-style fish screens, similar to those used for agricultural diversions, around the intake of each of the 64 new and 57 existing siphons on both the reservoir and habitat islands.

- Installing two new discharge pump stations on the reservoir islands, including one discharge pump station with 32 pumps on Webb Tract and another discharge pump station with 40 pumps on Bacon Island. All discharge pipes would be 36-inch-diameter. The installed pumps would be an assortment of axial-flow and mixed-flow pumps to accommodate a variety of head conditions and flow rates throughout draw down. Discharges would be pumped at a combined maximum daily average rate of 6,000 cfs, including discharge from the habitat islands. The combined monthly average discharge rate would not exceed 4,000 cfs.

The diversion of water onto the habitat islands is restricted to the existing water rights held by DW Properties and is limited to 200 cfs, 19 TAF annually. The 200 cfs amount is included in the maximum daily and monthly average rates of diversion listed above.

The habitat islands would be created and managed as proposed in the DW Project. See Section 3.2.2 of the In-Delta Storage Program Draft Report on Environmental Evaluations for a detailed description of the DW Habitat Management Plan.

As part of the Integrated Storage Investigations Program, and for the purpose of improving the DW proposed operations, Reclamation/DWR considered a Re-engineered Alternative. This alternative includes the same reservoir islands and habitat islands as the DW Project but changes the design of the levees and consolidates the 121 diversion structures and 72 discharge pumps for releases of water into four integrated facilities. For a more detailed discussion of this alternative, see the In-Delta Storage Program Draft Report on Engineering Investigations.

To further improve DW Project operational flexibility, another management option has been considered that replaces Webb Tract with Victoria Island and provides for a direct connection of Victoria Island to Clifton Court. In this case, Bacon Island and Victoria Island would be the reservoir islands and diversion and release of water would be realized through the use of two integrated facilities. In addition, water would be siphoned directly from Victoria Island to Clifton Court by gravity or pumping through a new siphon and pumping combination conveyance facility. For a more detailed discussion of this alternative, see the In-Delta Storage Program Draft Report on Engineering Investigations.

## 1.3 Water Quality Requirements

The water quality requirements are set forth in the SWRCB Decision 1643 and the Water Quality management Plan (WQMP) as agreed by DW Properties and the California Urban Water Agencies (CUWA).

### 1.3.1 General

1) Discharges of water from the DW Project shall not cause: (1) an exceedance of any applicable water quality objective in a water quality control plan adopted by the SWRCB or by the RWQCB; (2) any recipient water treatment plant to exceed the maximum contaminant levels for disinfection byproducts as set forth by EPA in Title 40, Section 141.12 & 141.30. The regulated classes of disinfection byproducts are trihalomethanes, haloacetic acids, chlorite, and bromate (SWRCB, condition 14.a.).
2) For the purpose of determining that the DW Project has caused an exceedance of one or more of the operational screen criteria, an uncertainty of ±5% of the screening criteria will be assumed.

### 1.3.2 Long-Term

The Project is required to mitigate 150% of the net increase in TOC and salt (i.e. TDS, bromide and chloride) loading greater than 5% in the urban diversions due to Project operations.

### 1.3.3 Total Organic Carbon

1) The project operation shall not cause or contribute to TOC concentrations that will violate either criteria:
   - Increase in TOC concentration at a SWP, CVP, CCWD pumping plant, or at a receiving water treatment plant that will cause the limit of 4.0 mg/L (14-day average) to be exceeded;
   - Incremental increase in TOC concentration at a SWP, CVP, or CCWD pumping plant of greater than 1.0 mg/L (14-day average) (SWRCB, condition 14.b.).

### 1.3.4 Chloride

1) Chloride concentration shall not:
    - Increase more than 10 mg/L chloride concentration at any of CCWD's intakes
    - Cause any increase in salinity of more than 10 mg/L chloride (14-day running average salinity) at any urban intake in the Delta
    - Cause or contribute to any salinity increase at one or more urban intake in the Delta if the intake is exceeding 90% of an adopted salinity standard (Rock Slough chlorine standard defined in SWRCB Decision 1641)

    (SWRCB, condition 14.c.)

### 1.3.5 Disinfection Byproducts

DW Project operations will be curtailed, rescheduled, or constrained to prevent impacts on drinking water quality at any water treatment plant receiving water from the Delta based on the following screening criteria (WQMP, Exhibit A, Attachment 2, condition B) if DW Project operations cause or contribute to:

1) Modeled or predicted Total Trihalomethanes (TTHM) concentrations in drinking water in excess of 64 µg/L, as calculated in the raw water of an urban intake in the Delta or at the outlet of a water treatment plant.
2) Modeled or predicted bromate concentrations in drinking water in excess of 8 µg/L, as calculated in the raw water of an urban intake in the Delta or at the outlet of a water treatment plant.

### 1.3.6 Dissolved Oxygen (DO)

1) No discharge of stored water if the DO of stored water:
    - Is less than 6.0 mg/L, or
    - Causes the level of DO in the adjacent Delta channel to be depressed to less than 5.0 mg/L, or
    - Depresses the DO in the San Joaquin River between Turner Cut and Stockton to less than 6.0 mg/L September through November. (SWRCB, condition 19.a.)

### 1.3.7 Temperature

1) No discharge of stored water if:
    - The temperature differential between the discharge water and receiving water is greater than 20º F,
    - It will increase the temperature of channel water by more than:
        - 4º F when the temperature of channel water ranges from 55º F to 66º F
        - 2º F when the temperature of channel water ranges from 66º F to 77º F
        - 1º F when the temperature of channel water is 77º F or higher

    (SWRCB, condition 20.b.)

## 1.4 Scope of Work

**1.4.1 Modeling Studies**: The following work was done in support of the water quality modeling studies in order to assess the feasibility of Project operations under the WQMP:

- Modify the DSM2 planning study setup to ensure compatibility with daily information from CALSIM2. Code and incorporate a reservoir release water quality module into DSM2.
- Complete several DSM2 input data tasks, including development of a non-repeating planning tide and salinity regression relationships at urban intakes.
- Develop CALSIM2 Artificial Neural Network modules that will ensure that the DW Project meet D-1641 salinity objectives. Develop CALSIM2 linear programming constraints and simplified operating rules that adequately represent the WQMP.
- Evaluate water quality impacts of operating the DW Project according to assumptions in the 2000 revised EIR/S.
- Conduct DSM2 studies employing Delta hydrology and operations provided by CALSIM2 studies and identify any exceedances of the WQMP. Evaluate water quality impacts of the DW Project and any limitations to operations under WQMP constraints.

**1.4.2 Water Quality Field Investigations:** The following work was done as part of the field investigations to estimate the TOC loading from peat soils on the reservoir islands.

- Review existing work on water quality impacts by DW consultants.
- Evaluate range of likely DOC concentrations and loads expected in DW discharges based on work done by DW, DWR, and USGS.
- Provide input for water quality modeling runs, including DOC ranges, times of filling and draining, and ambient channel DOC levels at those times based on MWQI historical data.
- Evaluate expected water quality impacts from seepage control well systems.
- Provide support to modeling studies to evaluate ability of DW Project to operate under the WQMP.
- Using EPA Treatment Cost model, evaluate economic impacts of any DW DOC impacts at the treatment plants.
- Evaluate expected costs of required DW water quality monitoring program.
- Perform soil analyses for the DW Proposal for organic carbon content to allow comparison to existing field data on test DOC sites in the Delta or SMARTS facilities.

**1.4.3 Water Quality Biological Productivity Studies:** The following work was done as part of the biological productivity studies to estimate TOC loading from plant growth on the reservoir islands.

- Identify key parameters affecting plant growth and degradation on the islands.
- Develop tractable groupings of plants that can be related to conditions on the islands and develop algorithms to describe plant growth.
- Analyze fate of organic carbon fixed on the islands during plant growth and develop algorithms to describe degradation and release of organic carbon to the Delta channels.
- Examine carryover affects from fill to fill and develop method of accounting for this in the modeling.

**1.4.4 Water Temperature and DO Studies:** The following work was done as part of the temperature and DO studies in order to assess the ability of the project to meet the aforementioned temperature and DO criteria.

- Analyze observed temperature and DO data to provide a range of values for the Delta and establish upper and lower bounds.
- Develop temperature and DO models for the reservoir islands based on heat budget and DO balance, respectively.
- Asses impacts to Delta channel water using mass balance equations.

## 1.5 Study Findings, Conclusions and Recommendations

### 1.5.1 General

**1.5.1.1 Key Findings and Conclusions:** Integration of the four water quality studies resulted in the general conclusion that:

- DSM2 Model runs showed exceedances of WQMP, DOC criteria at the urban intakes.
- DOC and disinfection by-product impacts could be higher than reported in the model simulations, as the simulations did not account for reservoir biological productivity.
- Additional impacts or reductions in yield could occur due to other water quality criteria, especially temperature and dissolved oxygen criteria.
- Compliance with the WQMP and SWRCB criteria would reduce water quality impacts to acceptable levels at the cost of reduced Project water supply.
- Project re-operations could likely reduce water quality impacts and increase supply.

#### 1.5.1.2 Recommendations

- Additional studies are needed to quantify the reduction in supply associated with meeting water quality criteria.
- Additional studies are also required to determine how re-operation of the Project might avoid or minimize water quality impacts without reducing supply.

- Subsequent studies should consider reservoir biological productivity.

### 1.5.2 Modeling Studies

**1.5.2.1 Key Findings and Conclusions:** Results from the water quality modeling studies can be summarized in three key findings:

- Alternative 2 has water quality impacts at all Delta urban drinking water intakes. Delta hydrology under the modeled scenario was such that a large percentage of Project releases, particularly Bacon Island releases, were drawn through Old River to the urban diversions. Project impacts, measured on both a short-term scale (monthly) and a long-term scale (3-year average), were more substantial for DOC than for TTHM and bromate. Water quality impacts could likely be reduced through Project re-operation.
- Exceedances of chloride criterion occurred in fall months without major Project releases or diversions and appear to result from CALSIM2 re-operation of the CVP/SWP system. The Project improved chloride concentrations at Banks Pumping Plant about 60 percent of the time.
- Project water quality impacts could be higher than reported in the model simulations. The water quality modeling studies did not account for changes in Project reservoir DOC concentrations due to bio-productivity and seepage returns. These factors could significantly increase the impact of Project releases at urban intakes.
- Alternative 2 Project water supply benefit is uncertain due to water quality impacts. Adding operational constraints to meet WQMP screening criteria would likely reduce Project water supply benefit for SWP/CVP exports. However, the actual reduction in Alternative 2 water supply benefit is unknown at this time.

#### 1.5.2.2 Recommendations

- Implement and refine CALSIM2 water quality operating rules through iteration with DSM2.
- Explicitly consider Project reservoir bio-productivity in subsequent water supply and water quality evaluations.
- Refine subsequent DSM2 modeling assumptions and output analysis as outlined in Chapter 2.

### 1.5.3 Water Quality Field Investigations

**1.5.3.1 Key Findings and Conclusions:** Field studies done to estimate TOC loading from peat soils indicate that:

- Carbon loading can be modeled using logistics equations representing flooding of islands with low and high organic peat soil and predicted concentrations at about 7 - 9 and 20 mg/L, respectively. These concentrations are generally lower than those found in agricultural drainage, or the no-project condition. However, the volume of

agricultural drainage discharged from the islands is probably much less than would be discharged from reservoirs filled to a water depth of 20 feet.
- About 50 to 80 percent of the maximum carbon loading would be reached in 5 months and over 90 percent after 10 months of storage, under the DW Project winter filling schedule.

#### 1.5.3.2 Recommendations

- Develop laboratory methods to correlate soil characteristics with organic carbon release and possibly develop additional logistics equations for different soil types.
- Update island soil survey to better understand the distribution of organic carbon availability.
- Do additional experiments to determine how management practices such as tilling the fields prior to flooding affect organic carbon loading.
- Do additional experiments to determine how alternating wet and dry periods affect microbial processes.

### 1.5.4 Water Quality Biological Productivity Studies

**1.5.4.1 Key Findings and Conclusions:** Results from the biological productivity study, based on the current literature and work and experience in the Delta and California, indicate that:

- Diversion and discharge timing are likely to be important factors that will determine what types of plant will dominate on the reservoir islands, how productive they'll be and how much fixed carbon will end up discharged.
- Phytoplankton is likely to dominate the first three to five years and contribute to TOC loading by about 1 to 6.5 mg/L. After that, submersed macrophytes will probably take over and contribute about 1 to 10 mg/L.
- Aquatic plant productivity would be highest under drained conditions and emergent plants would contribute about 5 to 50 mg/L.

#### 1.5.4.2 Recommendations

- Further evaluations are needed to investigate the complex ecological processes that will affect both short term and long term plant growth and carbon export for the reservoir islands.
- Begin experiments similar to the SMARTS peat soil studies but with a plant and algal productivity component included this winter 2001-2002. Results form this study should then be used to develop a bioproductivity module for CALSIM similar to the one developed for peat soils. Results should also be used to determine the direction of later, larger scale studies that will further reduce uncertainty.

### 1.5.5 Water Temperature and DO Studies

**1.5.5.1 Key Findings and Conclusions:** Results from the temperature and DO modeling indicate that:

- Based on three years of data, water temperature differentials between the proposed reservoirs and Delta channels ranged from 1 to 9 °F.

#### 1.5.5.2 Recommendations

- Additional modeling studies are needed to quantify the possible affects of temperature criteria on project yield.

# Chapter 2 Water Quality Modeling Studies

## 2.1 Description of Model Scenarios

Two model scenarios were evaluated as part of the In-Delta Storage water quality evaluation; both scenarios reflect Delta operations in accordance with SWRCB Decision 1641. The first scenario is a “base case” without In-Delta Storage Program facilities. The second scenario represents the In-Delta Storage Program “Re-engineered Alternative” as described in the Summary Report *(ISI, 2002a).* The second scenario is herein referred to as Alternative 2. Both model scenarios assume Delta hydrology and operations as provided by CALSIM2 model simulations and described in the Operations Study Report *(ISI, 2002b).*

Alternative 2 represents a modification of the originally proposed Delta Wetlands Project. In this alternative, Federal and State entities would acquire the Project from Delta Wetlands Properties and would operate it in accordance with the terms and conditions of the permit issued by the SWRCB and all other permits, agreements, and limitations imposed on the Project. The Project, as proposed by Delta Wetlands Properties, would include water storage and managed wetlands utilizing four islands in the Delta. The Project would divert and store water on Webb Tract and Bacon Island for export enhancement and seasonally divert water to create and enhance wetlands and wildlife habitat on Holland Tract and Bouldin Island. Modifications to the originally proposed Delta Wetlands Project include the relocation of intake/diversion structures.

## 2.2 Methodology

### 2.21 Tools

The water quality modeling studies were conducted with the Department’s Delta Simulation Model (DSM2). DSM2 was calibrated and validated for flow, stage and electrical conductivity (EC) in collaboration with the DSM2 Interagency Ecological Program Project Work Team. The model was also successfully validated for the transport of dissolved organic carbon (DOC) *(DWR, 2001).*

DSM2 simulations covered the 16-year period October 1, 1975 through September 30, 1991. Daily varying Delta hydrology and operations for the study period were provided by CALSIM2 as input to the DSM2 simulation. CALSIM2 rules were developed (*DWR, 2002*) to approximately meet the water quality screening criteria spelled out in the Delta Wetlands Water Quality Management Plan (*WQMP, 2000)*. However, scheduling deadlines did not allow for these rules to be implemented in CALSIM2.

Several new features were developed for DSM2 in support of the In-Delta Storage water quality evaluations. The key enhancements were (1) modified hydrodynamics, hydrology and operations input and (2) a dynamic flooded island algorithm. These new features are described briefly in the following paragraphs.

DSM2 planning studies typically utilize CALSIM2 hydrology and operations as input. In the past, CALSIM2 has provided this input on a monthly time step. As part of the In-Delta Storage evaluations, CALSIM2 was enhanced to simulate Delta operations on a daily time step. Several complex modifications were made to the DSM2 planning study setup to ensure compatibility with daily information from CALSIM2. The DSM2 planning study setup was also modified to accommodate a historical based (non-repeating) tide. Previous DSM2 planning studies utilized a 25-hour repeating tide to represent the model's downstream boundary at Martinez. While such an approach is computationally advantageous when used in conjunction with a monthly varying hydrology, it does not allow for the evaluation of spring-neap effects. A 16-year historical based planning tide was developed to reflect approximate historical conditions for every computational time step (i.e. 15 minutes) of the DSM2 simulation period *(DWR, 2001)*. Using this historical based tide, DSM2 provides more meaningful hydrodynamic and water quality responses to daily changing hydrology and operations and incorporates spring-neap tidal variations.

As described in Chapter 3 of this report, an extensive literature review was conducted, and experimental data were interrogated to develop a conceptual model and mathematical algorithm that relates organic water quality changes in flooded Delta islands to peat soil interactions. Key explanatory variables in the flooded island algorithm include diversion water quality, residence time, season, water level, and soil characteristics. This algorithm was coded and incorporated in DSM2 to provide a dynamic simulation of water quality changes in the Project reservoirs.

### 2.2.2 Evaluation Criteria

The water quality modeling studies utilized the Delta Wetlands WQMP as the basis for developing evaluation criteria. The WQMP identifies several urban intakes as having the potential to be negatively impacted by the Delta Wetlands project. For these studies, model results were evaluated at the following urban intakes: Old River at Rock Slough, Old River at the Los Vaqueros Reservoir intake, Banks Pumping Plant and Tracy Pumping Plant.

The WQMP outlines several screening criteria, including constraints on total organic carbon (TOC), chloride, total trihalomethanes (TTHMs), and bromate. Water quality values are generally specified as 14-day averages in the WQMP. In order to meet scheduling deadlines, water quality modeling results were evaluated and expressed as monthly averages. See *DWR (2002)* for a detailed discussion on how the WQMP screening criteria were translated into modeling constraints. The key evaluation criteria utilized in this study were as follows:

1. The Project cannot cause an increase in chloride of more than 10 mg/l, and it cannot cause or contribute to any salinity increases at urban intakes exceeding 90% of adopted salinity standards.

2. The Project cannot cause an increase in TOC of more than 1.0 mg/l, and it cannot cause TOC to exceed 4.0 mg/l at urban intakes.[1]
3. The Project cannot cause or contribute to TTHM concentrations in excess of 64 µg/l, as calculated in raw water of urban intakes.
4. The Project cannot cause or contribute to bromate concentrations in excess of 8 µg/l, as calculated in raw water of urban intakes.
5. The Project cannot cause a net long-term increase in TOC and salt loading greater than 5% in the urban diversions due to Project operations. For the In-Delta Storage water quality evaluation, long-term impacts were calculated as flow-weighted 3-year running averages.

### 2.2.3 Simulated Constituents

DSM2 model simulations were conducted for EC and DOC. Both water quality constituents were assumed to behave conservatively in the Delta channels. Conservative behavior has been assumed in other Delta simulations of organic water quality transport (*Hutton and Chung, 1992*). As discussed in Section 2.2.1, non-conservative behavior in the Project reservoirs (due to peat soil interactions) was modeled. DOC was used as a surrogate for TOC and EC was used as a surrogate for chloride and bromide in the model simulations. In order to meet scheduling deadlines, a statistical relationship between ultraviolet absorbance at 254 nm (UVA) and DOC at the urban intakes was developed using results from previous Delta Wetlands evaluations. Simulated DOC and bromide (converted from EC) values, computed UVA values, and approximate water temperatures were used to compute TTHM concentrations. Water temperature was not simulated. Instead, an annually repeating time series was assumed to represent water temperature at all urban diversions. Refer to *DWR (2002)* for supporting documentation on simulated constituents.

### 2.2.4 “Bookend” Analysis

The water quality modeling studies utilized sensitivity or “bookend” analysis to characterize changes in Project reservoir DOC concentrations. Thus, Alternative 2 includes a “low bookend” scenario and a “high bookend” scenario to cover the likely range of Project impacts. This methodology was adopted to account for the high degree of scientific uncertainty associated with peat soil interactions under flooded island conditions. Bookend analysis was utilized in previous Delta Wetlands evaluations.

[1] For the In-Delta Storage water quality evaluation, DOC was used as a surrogate for TOC.

### 2.3 Key Assumptions

### 2.3.1 Project Configuration

The configurations of In-Delta Storage reservoir island intake and discharge locations, as modeled by DSM2, are shown in Figures 2-1 and 2-2. Additional information on Project configuration modeling assumptions is provided in the Water Quality Modeling Technical Appendix (*DWR, 2002*).

**Figure 2-1 DSM2 Representation of Bacon Island**

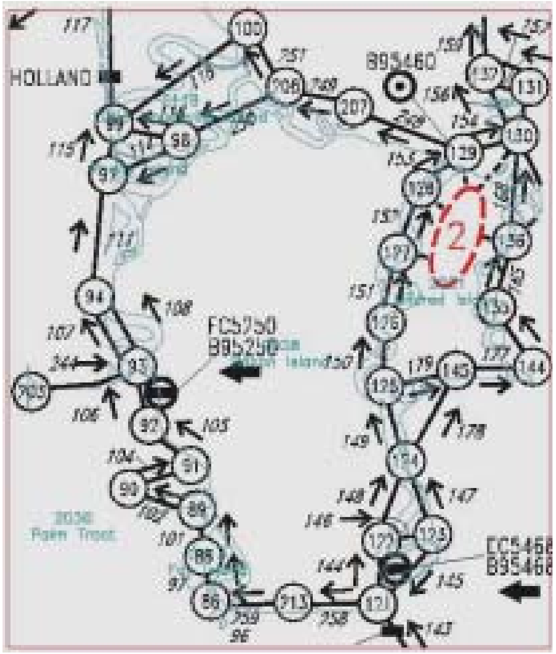
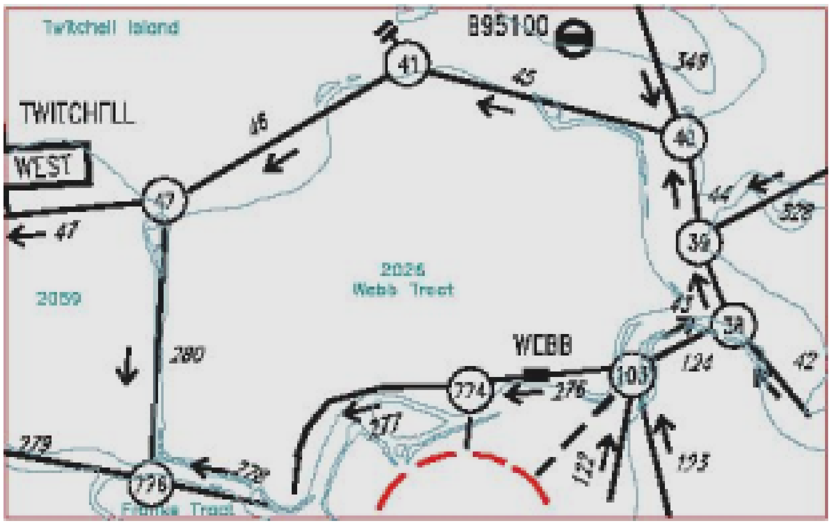


**Figure 2-2 DSM2 Representation of Webb Tract**



### 2.3.2 Delta Hydrology and Operations

The water quality modeling studies assume Delta hydrology and operations as provided by CALSIM2 model simulations. Key Delta operations provided by CALSIM2 include Delta Cross Channel gate operations and daily pumping rates at Rock Slough, Banks Pumping Plant and Tracy Pumping Plant.

The CALSIM2 studies assume that all Contra Costa Water District (CCWD) diversions were made at the Rock Slough diversion. As information was not readily available on the expected operation of the Los Vaqueros Reservoir intake, diversions at this location were not simulated in DSM2 and all CCWD diversions were assumed to be made at Rock Slough. Nevertheless, water quality simulation results were evaluated at all intakes. This simplifying assumption was expected to have little impact on Delta hydrodynamics, water quality transport and overall study conclusions since CCWD diversion volumes were small relative to total Old River flow.

Key Delta operations simulated in the water quality modeling studies (but not provided by CALSIM2) include South Delta barriers, Clifton Court Forebay gates and the Suisun Marsh Salinity Control Gate. The studies assumed operation of four permanent South Delta barriers at the following locations: Old River at Head, Old River at Tracy, Middle River and Grant Line Canal. Additional information on gate and barrier assumptions is provided in the Water Quality Modeling Technical Appendix (*DWR, 2002*).

### 2.3.3 Delta Inflow Water Quality Boundary Conditions

Time series of Delta inflow DOC concentrations were developed from available flow and water quality grab sample data to provide boundary conditions for DSM2. Field observations suggest that organic concentrations can vary considerably during a month at the model boundary locations, particularly during high precipitation runoff periods in winter. But due to a lack of continuous DOC monitoring, a time interval of one month was selected for the boundary condition time series. Delta inflow DOC boundary conditions for the 16-year simulation period are shown in Figure 2-3. Standard DSM2

**Figure 2-3a Delta Inflow DOC Boundary Conditions: 1975-1983**

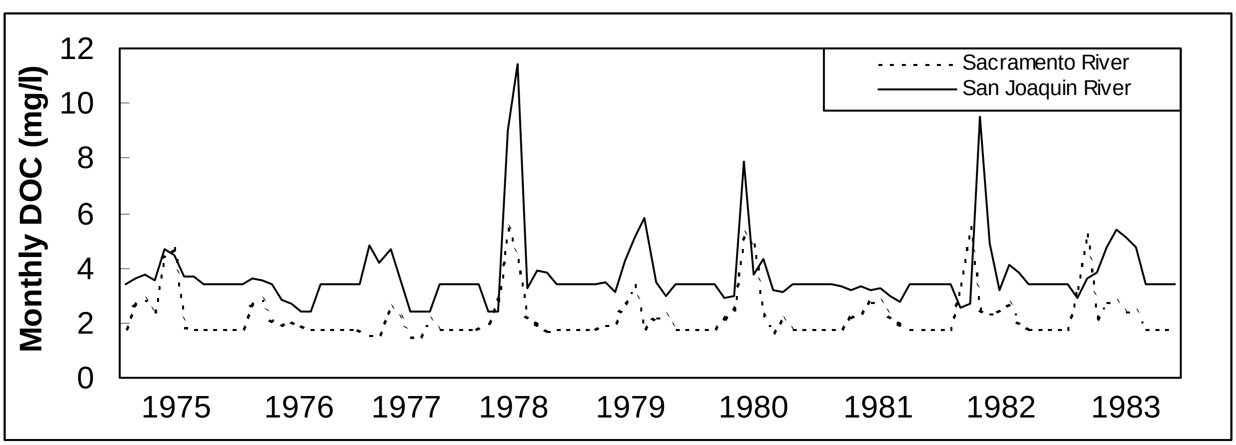
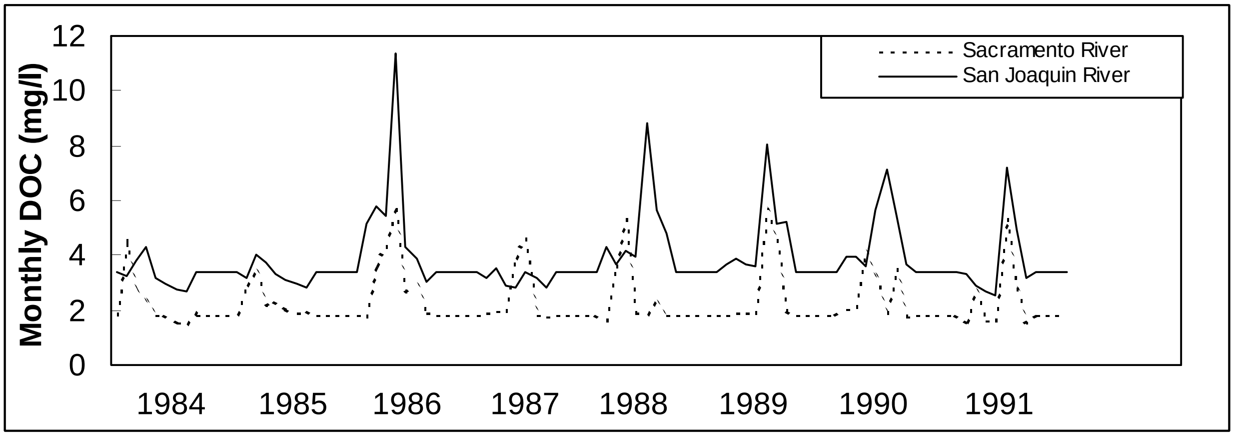


**Figure 2-3b Delta Inflow DOC Boundary Conditions: 1984-1991**




water quality boundary assumptions were employed for the EC simulations. Additional information on the development of Delta inflow water quality boundary conditions is provided in the Water Quality Modeling Technical Appendix (*DWR, 2002*).

### 2.3.4 Project Storage and Habitat Islands

Project reservoir evaporation and diversion/release flows were provided by the Alternative 2 CALSIM2 operations study. Reservoir seepage return flows were not modeled. Habitat island diversion and return flows, which are relatively small, were assumed in accordance with the Delta Wetlands Environmental Impact Report (*JSA, 2000*). To ensure consistency with the CALSIM2 operations studies, Delta-wide consumptive use (based upon a 2020 level of development) was held constant between the Base scenario and Alternative 2. Thus, diversion and return flows associated with Webb Tract, Bacon Island, Holland Tract and Bouldin Island under the Base scenario were proportionally distributed among the remaining Delta agricultural islands under Alternative 2. This methodology compromises a more accurate representation of a Project “credit” (through reduced agricultural return flows and associated pollutant loads) in favor of an overall water balance with CALSIM2. However, previous Delta Wetlands evaluations show that the water quality benefits associated with the “credit” is small (*DWR, 2002*).

With respect to water quality, Project reservoirs were modeled as fully mixed, i.e. diversion volumes fully mix with storage volumes at each time step of the model simulation. As a simplifying assumption, reservoir water quality was not updated to reflect the concentrating effects of evaporation and the diluting effects of precipitation. This more accurate modeling approach would have required extensive model enhancements and would not have changed the model results significantly.

As discussed in Section 2.2.1, DOC was dynamically modeled as a non-conservative constituent in the Project reservoirs. The algorithm describing water quality interactions with peat soil, discussed at length in Chapter 3 and in the Water Quality Modeling Technical Appendix (*DWR, 2002*), is based upon the following logistic equation:

$$DOC(t) = \frac{A}{1 + Be^{-kt}}$$

where A represents the maximum DOC concentration in mg/l, B is a dimensionless parameter calculated from the initial DOC concentration, k is the growth rate in days$^{-1}$, and t is the water storage duration in days. Parameter values assumed for the low and high bookend scenarios are provided in Table 2-1. Non-conservative behavior of Project reservoir DOC concentrations due to bio-productivity was not modeled in DSM2. Discussion and analysis of bio-productivity in the Project reservoirs are provided in Chapter 4.

Habitat island water quality was not modeled dynamically, since the small winter return flow volumes were expected to have little impact on overall simulation results. Instead, fixed concentrations based on field observations *(Jung, 2001)* were assumed to represent typical winter return water quality. Values of 50 mg/l DOC and 750 umhos/cm EC were assumed for Bouldin Island and 40 mg/l DOC and 1100 umhos/cm EC were assumed for Holland Tract.

**Table 2-1 Reservoir Island Parameter Values**

| **Scenario** | **A (mg/l)** | **κ (days$^{-1}$)** |
|---|---|---|
| Low Bookend | 70 | 0.022 |
| High Bookend | 215 | 0.022 |

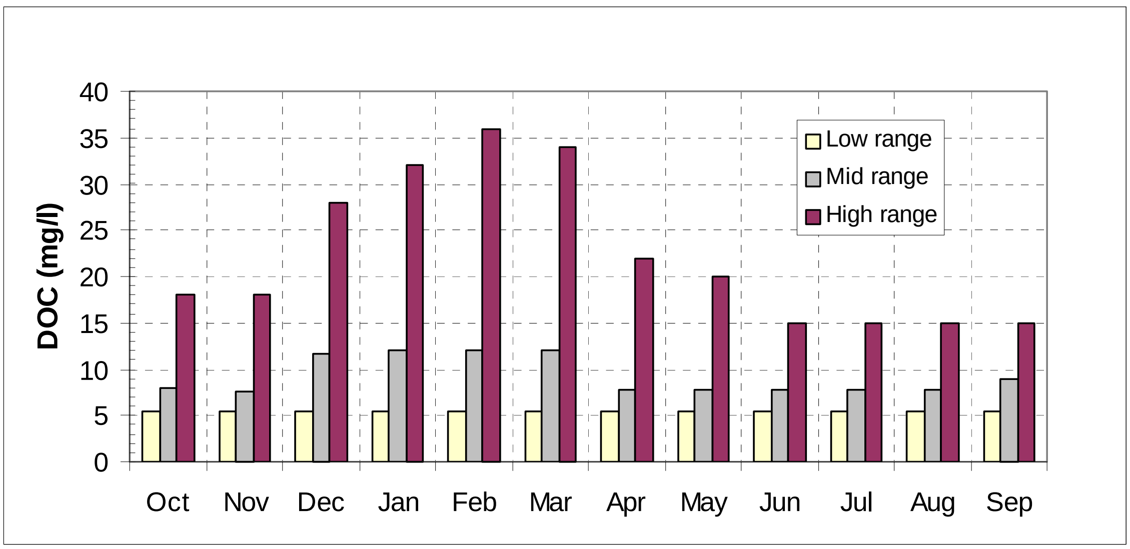
### 2.3.5 Delta Agricultural Islands

Delta island diversion and return flow volumes were not measured in the field but were estimated with the Department's Delta Island Consumptive Use (DICU) model (*DWR, 1995a*). The DICU model computes diversion and return volumes on a monthly time step and allows for annual variability in response to changes in Delta land use, precipitation and pan evaporation. Return salinity water quality estimates are documented elsewhere (*DWR, 1995b*). Return organic water quality estimates were based on MWQI measurements. Due to a lack of comprehensive monitoring of over 200 agricultural drains in the Delta, return organic water quality data were compiled using a simplified aggregation technique *(Jung and Associates, 2000*). The Delta was segregated into three DOC sub-regions: high-, mid- and low-DOC. For each sub-region, representative monthly average DOC and UVA values were developed. UVA values were assumed as a linear function of DOC concentrations in all Delta island return flows. DOC and UVA values were assumed to vary by month but not by year. Monthly DOC concentrations from the three sub-regions are displayed in Figure 2-4.

## 2.4 Results

Water quality modeling results for chloride, DOC, TTHM and bromate at all four urban intakes are discussed below. For illustration purposes, results at Banks Pumping Plant are presented in Appendix 2A. Additional results at Old River at Rock Slough, Old River at Los Vaqueros Reservoir intake and Tracy Pumping Plant may be found in Appendix 2B and in the Water Quality Modeling Technical Appendix (*DWR, 2002*). Water quality modeling results are expressed as monthly averages.

**Figure 2-4 Monthly Agricultural Return Flow DOC Concentrations**




Tables summarizing exceedances of the water quality screening criteria at all four urban intake locations are also provided in this section. Exceedance frequencies were computed as percentages of the total number of months in the 16-year model simulation, not as percentages of the number of months when the Project was actively releasing water. Eight major Project releases were made during the 16-year simulation period.

The chloride criterion restricts the incremental Project impact to less than 10 mg/l; it further prohibits the Alternative scenario from exceeding 90 percent of the adopted 250 mg/l urban standards (i.e. 225 mg/l). The DOC criterion generally restricts the incremental Project impact to less than 1 mg/l. When the Base scenario is between 3 and 4 mg/l DOC, the Project cannot cause DOC to exceed 4 mg/l, resulting in an allowable DOC change between 0 and 1 mg/l. The TTHM criterion is violated when the Project causes urban intake concentrations to exceed 64 µg/l. When this value is exceeded under the Base scenario, an exceedance is assumed to occur when the incremental change exceeds 3.2 µg/l (5% of 64 ug/l). Similarly, the bromate criterion is violated when the Project causes urban intake concentrations to exceed 8 µg/l. When this value is exceeded under the Base scenario, an exceedance is assumed to occur when the incremental change exceeds 0.4 µg/l (5% of 8 ug/l).

Delta hydrology under the Alternative 2 scenario was such that a large percentage of Project releases, particularly Bacon Island releases, were drawn directly through Old River to the urban diversions. This system response, which was visually analyzed through DSM2 particle tracking, often translated into significant drinking water quality impacts when high-volume Project releases were made.

### 2.4.1 Monthly Average Chloride

Figures 2-5 and 2-6 show salinity changes over the 16-year simulation period in the Project reservoirs on Bacon Island and Webb Tract, respectively. Changes in reservoir EC occurred when Delta channel water was diverted into the reservoirs. In higher flow situations, conservative mixing improved reservoir water (e.g. 1979) and in lower flow situations it degraded water quality (e.g. 1977). As discussed in Section 2.3.4, concentration changes due to evaporation and precipitation were not modeled.

A summary of how often Alternative 2 exceeded the 10mg/l chloride screening criterion at each urban intake is given in Table 2-2. The highest exceedance frequency occurred at Rock Slough, where the chloride criterion was exceeded approximately 6 percent of the time. Exceedance frequencies decrease with distance from the ocean, the major chloride source. Exceedances of the 10 mg/l chloride screening criterion generally occurred in fall months when there were no major releases from or diversions to the Project reservoir islands. Therefore, chloride exceedances were not directly related to Project releases or diversions but appear to result from CALSIM2 re-operation of the CVP/SWP system.

**Table 2-2 Frequency of Chloride Constraint Exceedances**

| Location | # months in 16 years | % months in 16 years |
|---|---|---|
| Old River at Rock Slough | 11 | 6 |
| Old River at Los Vaqueros Intake | 10 | 5 |
| Banks Pumping Plant | 7 | 4 |
| Tracy Pumping Plant | 7 | 4 |

Figure 2A-1 (see Appendix 2A) shows the monthly average chloride concentration at Banks Pumping Plant over the 16-year simulation period. The Base and Alternative 2 scenarios exceeded the 225 mg/l chloride criterion in one month at the Tracy Pumping Plant and in three months at Rock Slough. Figure 2A-2 shows the change in chloride over the 16-year simulation period at Banks Pumping Plant. As shown in the figure, Alternative 2 results in incremental improvements as well as degradations over the 16-year period. Figure 2A-3 shows a cumulative distribution of chloride changes at Banks Pumping Plant. Alternative 2 improved chloride concentrations at Banks Pumping Plant about 60 percent of the time.

**Figure 2-5a Changes in Bacon Island EC: Water Years 1976-83**

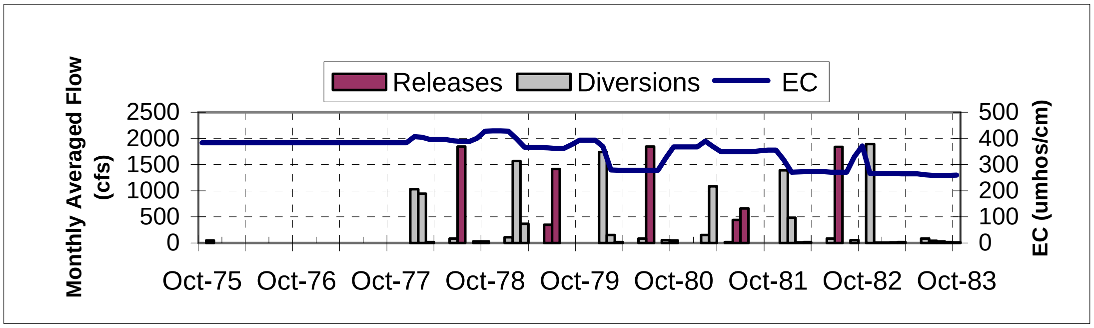



**Figure 2-5b Changes in Bacon Island EC: Water Years 1984-91**

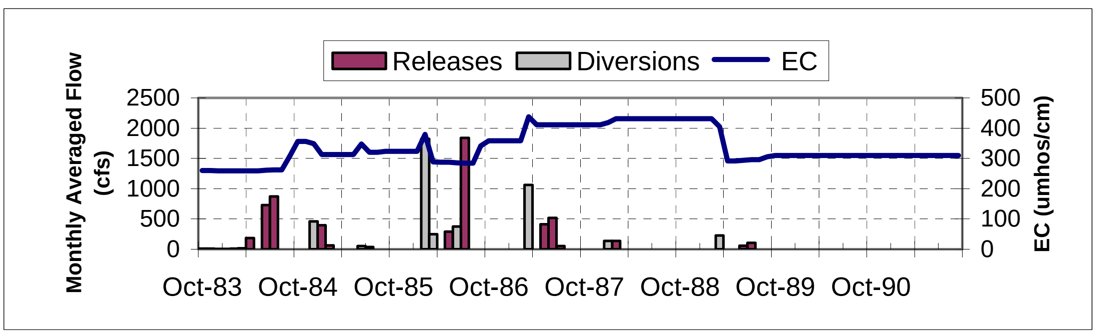



**Figure 2-6a Changes in Webb Tract EC: Water Years 1976-83**

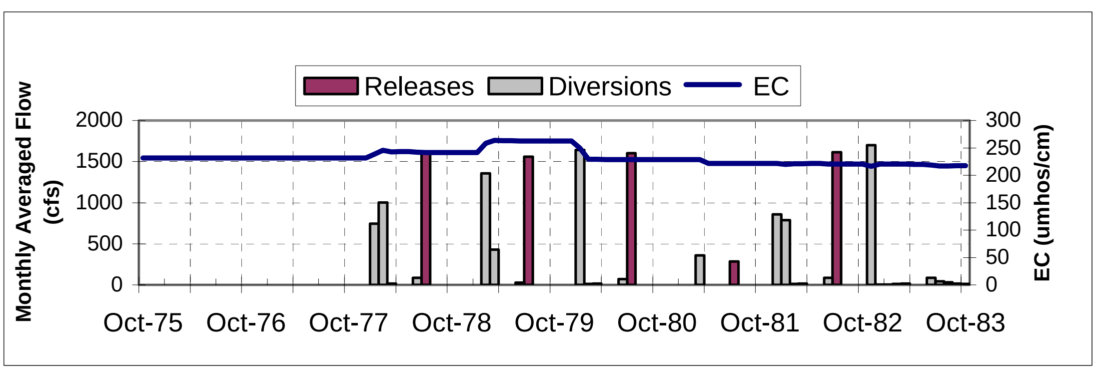
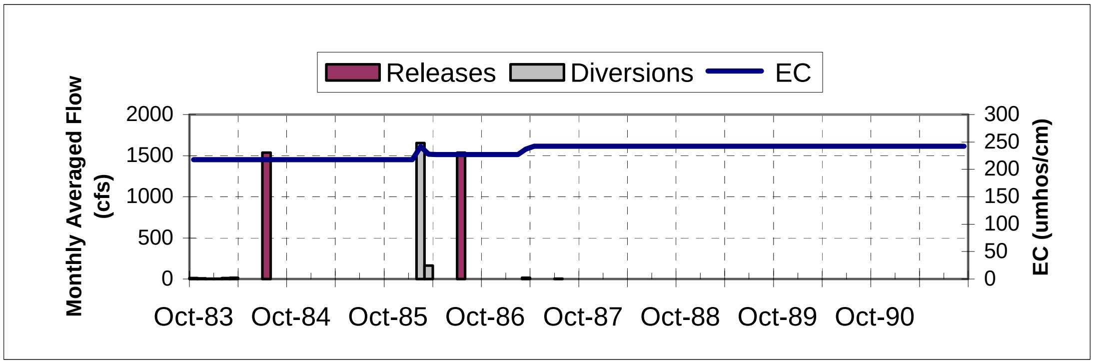


**Figure 2-6b Changes in Webb Tract EC: Water Years 1984-91**




## 2.4.2 Monthly Average DOC

Figures 2-7 and 2-8 show changes in Bacon Island and Webb Tract DOC concentration over the 16-year simulation period. Changes in reservoir DOC resulted from Delta channel diversions and peat soil interactions (see Sections 2.2.1 and 2.3.4). As already discussed, bookend values were selected to represent realistic lower and upper bounds of DOC changes in the Project reservoirs due to peat soil interactions.

In some circumstances the bookend did not provide a realistic lower bound. These circumstances arose when channel diversion concentrations exceeded the low bookend concentration. The maximum DOC concentration associated with the low bookend is approximately 6-7 mg/l under full reservoir conditions. Model output was adjusted so that the peat soil algorithm never forced reservoir DOC concentrations below values computed by conservative mixing.

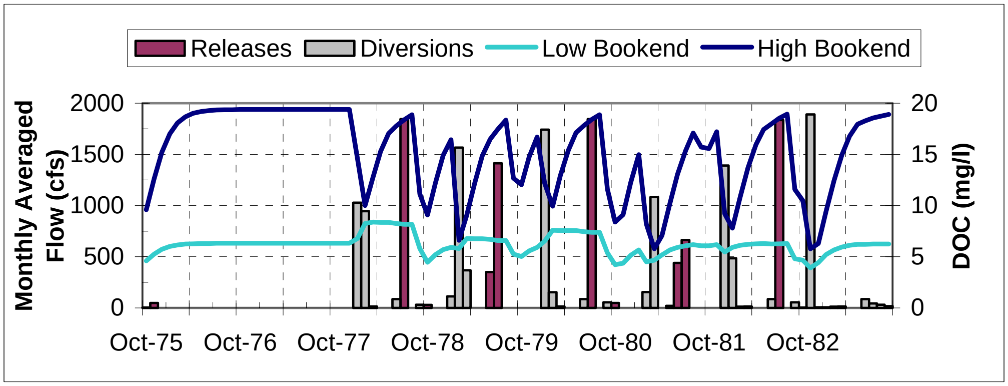
The above approach resulted in maximum reservoir DOC concentrations of 10 and 22 mg/l for the low and high bookend scenarios, respectively. However, reservoir releases for the high bookend condition rarely coincided with periods of peak reservoir DOC concentrations over the 16-year simulation. A notable exception was in 1984. In that year, maximum high bookend DOC concentrations existed in the Bacon Island and Webb Tract reservoirs, reflecting holding times greater than one year.

A summary of how often Alternative 2 exceeded the DOC screening criterion at each urban intake is given in Table 2-3. The highest exceedance frequency occurred at the Banks and Tracy Pumping Plants under the high bookend scenario, where the DOC criterion was exceeded approximately 4 percent of the time.

## Table 2-3: Frequency of DOC Constraint Exceedances

| Location | Low Bookend (# months in 16 yrs) | Low Bookend (% months in 16 yrs) | High Bookend (# months in 16 yrs) | High Bookend (% months in 16 yrs) |
|---|---|---|---|---|
| Old River at Rock Slough | 0 | 0 | 6 | 3 |
| Old River at Los Vaqueros Intake | 1 | 1 | 6 | 3 |
| Banks Pumping Plant | 4 | 2 | 7 | 4 |
| Tracy Pumping Plant | 4 | 2 | 7 | 4 |

## Figure 2-7a Bacon Island DOC: Water Years 1976-83




## Figure 2-7b Bacon Island DOC: Water Years 1984-91

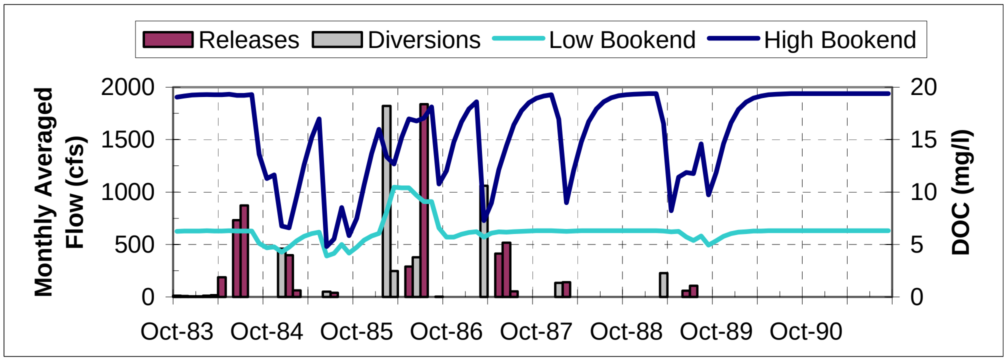


**Figure 2-8a Webb Tract DOC: Water Years 1976-83**

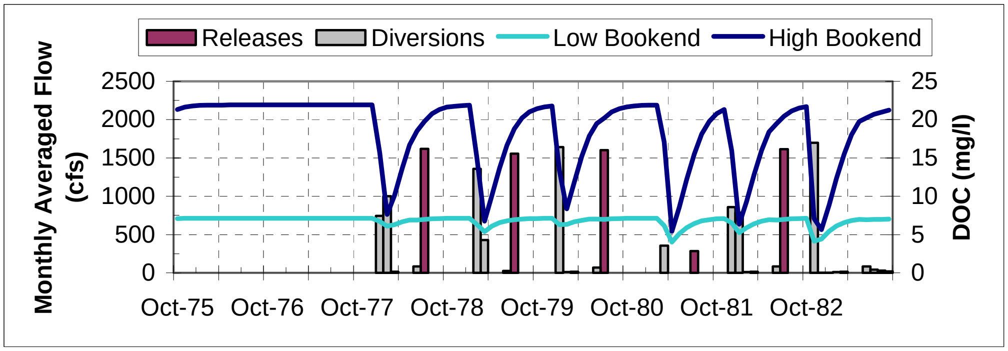



**Figure 2-8b Webb Tract DOC: Water Years 1984-91**

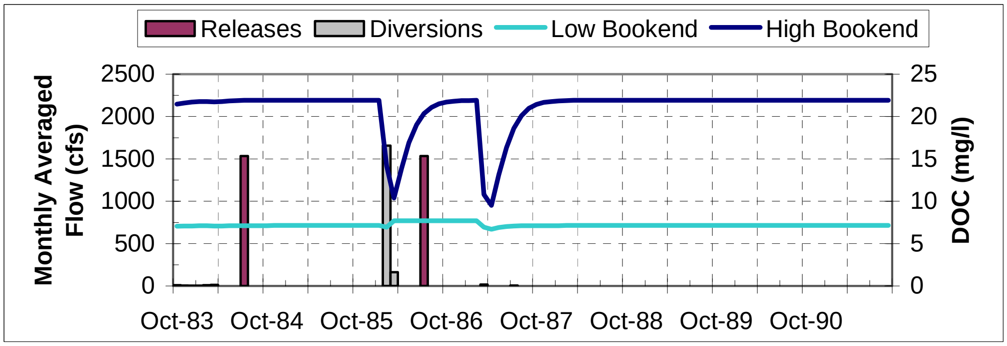



Figure 2A-4 shows the monthly average DOC concentration at Banks Pumping Plant over the 16-year simulation period. Under the Base scenario, peak urban intake DOC concentrations corresponded with high precipitation runoff periods that typically occur in winter and early spring. These peak periods did not normally coincide with Project releases in Alternative 2.

Figure 2A-5 shows the change in DOC over the 16-year simulation period at Banks Pumping Plant. Both bookend scenarios exceeded the screening criterion for DOC changes. The high bookend scenario exceeded the criterion at all urban intakes during six of the eight major Project release periods. The low bookend scenario exceeded the criterion at Banks and Tracy Pumping Plants during four out of eight major Project release periods. The low bookend scenario exceeded the criterion only once at Los Vaqueros intake.

Figure 2A-6 shows a cumulative distribution of DOC changes at Banks Pumping Plant. The low and high bookend scenarios improved DOC concentrations at Banks Pumping Plant 92 and 87 percent of the time, respectively.

### 2.4.3 Monthly Average TTHM

Simulated EC and DOC values were utilized to compute TTHM concentrations at the four urban intakes. See the Water Quality Modeling Technical Appendix *(DWR, 2002)* for details on the assumptions related to EC as a surrogate for bromide and for the methodology for computing TTHM concentrations. A summary of how often Alternative 2 exceeded the TTHM screening criterion at each urban intake is given in Table 2-4. The highest exceedance frequencies occurred at the Banks Pumping Plant under the high bookend scenario, where the TTHM criterion was exceeded approximately 1 percent of the time.

**Table 2-4 Frequency of TTHM Constraint Exceedances**

| **Location** | **Low Bookend (# months in 16 yrs)** | **Low Bookend (% months in 16 yrs)** | **High Bookend (# months in 16 yrs)** | **High Bookend (% months in 16 yrs)** |
|---|---|---|---|---|
| Old River at Rock Slough | 0 | 0 | 0 | 0 |
| Old River at Los Vaqueros Intake | 0 | 0 | 0 | 0 |
| Banks Pumping Plant | 0 | 0 | 1 | 1 |
| Tracy Pumping Plant | 0 | 0 | 0 | 0 |

The sensitivity of TTHM formation at Banks Pumping Plant to Project reservoir releases is shown in Figures 2A-7 and 2A-8. In March 1977, the 64 µg/l TTHM limit was exceeded at three urban intakes under the Base scenario and at two urban intakes under the Alternative 2 low and high bookend scenarios. Additionally, the limit was exceeded at Banks Pumping Plant in July 1986 under the high bookend scenario. Figure 2A-8 shows the incremental change in TTHM concentration over the 16-year simulation period at Banks Pumping Plant. The 3.2 µg/l maximum allowable increase in TTHM applied only when the 64 µg/l limit was exceeded in the Base scenario. The TTHM screening criterion was of no consequence under the Alternative 2 low bookend scenario.

### 2.4.4 Monthly Average Bromate

Simulated EC and DOC values were utilized to compute bromate concentrations at the four urban intakes. See the Water Quality Modeling Technical Appendix *(DWR, 2002*) for details on the assumptions related to EC as a surrogate for bromide and the methodology for computing bromate concentrations. A summary of how often Alternative 2 exceeded the bromate screening criterion at each urban intake is given in Table 2-5. The highest exceedance frequency occurred at Tracy and Banks Pumping Plants, where the criterion was exceeded approximately 1 percent of the time under both bookend scenarios. Similar to the trend observed for chloride, exceedances of the bromate screening criterion generally occurred in fall months when there were no major releases from or diversions to the Project reservoir islands. Therefore, bromate exceedances were not directly related to Project releases or diversions but appear to result from CALSIM2 re-operation of the CVP/SWP system.

**Table 2-5 Frequency of Bromate Constraint Exceedances**

| Location | Low Bookend (# months in 16 yrs) | Low Bookend (% months in 16 yrs) | High Bookend (# months in 16 yrs) | High Bookend (% months in 16 yrs) |
|---|---|---|---|---|
| Old River at Rock Slough | 1 | 1 | 1 | 1 |
| Old River at Los Vaqueros Intake | 1 | 1 | 1 | 1 |
| Banks Pumping Plant | 2 | 1 | 2 | 1 |
| Tracy Pumping Plant | 2 | 1 | 2 | 1 |

The sensitivity of bromate formation at Banks Pumping Plant to Project reservoir releases and to the Delta hydrology is shown in Figures 2A-9 and 2A-10. The 8 µg/l bromate limit was exceeded in 24 months under the Base scenario and in 21 months under both bookend scenarios. All but two of the 21 months coincide with months when the Base scenario exceeded the bromate limit. Figure 2A-10 shows the change in bromate concentration over the 16-year simulation period at Banks Pumping Plant. The 0.4 µg/l maximum allowable increase in bromate applied only when the 8 µg/l limit was exceeded under the Base scenario.

### 2.4.5 Long-Term Chloride

Figure 2A-11 shows a 3-year average of the chloride mass loading at Banks Pumping Plant under the Base and Alternative 2 scenarios for the latter 13 years of the simulation. Figure 2A-12 shows the change in long-term chloride mass loading at Banks Pumping Plant and Figure 2A-13 shows a cumulative distribution of the change in long-term chloride mass loading. A summary of how often Alternative 2 caused a long-term change in chloride loading greater than 5 percent is given in Table 2-6 for each urban intake. The highest exceedance frequency occurred at Rock Slough with 14 out of 156 months exceeding the 5 percent criterion. Mass loading was not computed at Los Vaqueros intake, as information on diversion volume was not available. (Exceedance frequency would likely fall between those reported at Rock Slough and Banks Pumping Plant).
As discussed in Section 2.4.1, chloride exceedances were not directly related to Project releases or diversions but appear to result from CALSIM2 re-operation of the CVP/SWP system.

**Table 2-6 Frequency of Long-Term Chloride Constraint Exceedances**

| Location | # months in 13 years | % months in 13 years |
|---|---|---|
| Old River at Rock Slough | 14 | 9 |
| Old River at Los Vaqueros Intake | n/a | n/a |
| Banks Pumping Plant | 8 | 5 |
| Tracy Pumping Plant | 0 | 0 |

### 2.4.6 Long-Term DOC

Figure 2A-14 shows a 3-year average of the long-term DOC mass loading at Banks Pumping Plant under the Base and Alternative 2 scenarios. The change in long-term DOC mass loading at Banks Pumping Plant is shown in Figure 2A-15, and a cumulative distribution of the change in long-term DOC mass loading is shown in Figure 2A-16. Alternative 2 did not exceed the 5 percent criterion under the low bookend scenario. However, the criterion was frequently violated under the high bookend scenario. Table 2-7 summarizes the long-term DOC exceedances at each urban intake. The greatest exceedance frequency occurred at Banks and Tracy Pumping Plants. (Exceedance frequency would likely be similar at Los Vaqueros intake but was not computed as pumping information was not available). At Banks Pumping Plant, the 5 percent criterion was exceeded 50 percent of the time under the high bookend scenario.

**Table 2-7 Frequency of Long-Term DOC Constraint Exceedances**

| Location | Low Bookend (# months in 13 yrs) | Low Bookend (% months in 13 yrs) | High Bookend (# months in 13 yrs) | High Bookend (% months in 13 yrs) |
|---|---|---|---|---|
| Old River at Rock Slough | 0 | 0 | 12 | 8 |
| Old River at Los Vaqueros Intake | n/a | n/a | n/a | n/a |
| Banks Pumping Plant | 0 | 0 | 78 | 50 |
| Tracy Pumping Plant | 0 | 0 | 39 | 25 |

## 2.5 Findings and Recommendations

### 2.5.1 Findings

Results from water quality modeling studies can be summarized in three key findings:

1. ***The Project could influence water quality at all Delta urban drinking water intakes.***

Delta hydrology under the Alternative 2 scenario was such that a large percentage of Project releases, particularly Bacon Island releases, were drawn directly through Old River to the urban diversions. Given this system response, high-volume Project releases could have a significant influence on urban diversion water quality. Project impacts, measured on both short-term (monthly) and long-term scales (3-year average), were particularly significant for chloride and DOC and less significant for TTHM and bromate. Water quality impacts could likely be reduced through Project re-operation. A refined operation could be generated upon implementation of rules in CALSIM2 that address drinking water quality constraints.

With respect to chloride concentrations at the urban intakes, Alternative 2 resulted in incremental improvements as well as degradations over the 16-year simulation period. Exceedance frequency of the WQMP chloride screening criteria followed a clear geographic pattern. Exceedance frequency decreased with distance from the ocean (the major chloride source), i.e. more exceedances at Rock Slough and fewer exceedances at Tracy Pumping Plant. Exceedances of the 10 mg/l criterion generally occurred in fall months when there were no major releases from or diversions to the Project reservoir islands. Therefore, chloride exceedances were not directly related to Project releases or diversions but appear to result from CALSIM2 re-operation of the CVP/SWP system.

Alternative 2 often resulted in lower DOC concentrations at the urban intakes but also included significant periods of degradation. Exceedances of the 1 mg/l criterion occurred at urban intakes under both low and high bookend scenarios. No exceedances of the long-term criterion occurred under the low bookend scenario. Under the high bookend scenario, however, urban intakes were in exceedance of the long-term criterion between 8 and 50 percent of the time. According to the WQMP, significant mitigation would be required to offset such long-term impacts.

Alternative 2 suggests that TTHM and bromate screening criteria would rarely control Project operations. Frequency of TTHM and bromate exceedances was low under both bookend scenarios. Under the Base scenario, the 64 μg/l TTHM limit was rarely exceeded while the 8 μg/l bromate limit was frequently exceeded. Similar to the trend observed for chloride, exceedances of the bromate screening criterion generally occurred in fall months when there were no major Project releases or diversions. Therefore, bromate exceedances were not directly related to Project releases or diversions but appear to result from CALSIM2 re-operation of the CVP/SWP system.

***2. Project water quality impacts could be higher than reported in the model simulations.***

The water quality modeling studies did not account for changes in Project reservoir DOC concentrations due to bio-productivity and seepage returns. These factors could increase the impact of Project releases at urban intakes. Refer to Chapter 4 for an assessment of potential Project impacts due to bio-productivity.

The water quality modeling studies evaluated and expressed results as monthly averages, while WQMP screening criteria are generally expressed as 14-day averages. Monthly averages filter peak events, thereby reducing impacts that would be measured on a daily basis.

***3. Project water supply benefit is highly uncertain due to water quality impacts.***

Adding operational constraints to meet WQMP screening criteria would likely reduce the water supply benefit reported by CALSIM2. However, the actual reduction in Alternative 2 water supply benefit is unknown at this time.

### 2.5.2 Recommendations

The frequency and severity of water quality exceedances in the Alternative 2 scenario demonstrate that the simulated operations are not in accordance with the terms and conditions of the permit issued by the SWRCB and other limitations imposed on the Project. As a result, the water supply benefit associated with Alternative 2 is not a reliable indication of the Project's true benefit. It is recommended that additional water supply and water quality modeling be conducted to arrive at a more accurate estimate of Project benefit. The following modeling tasks are suggested:

- Implement and refine CALSIM2 water quality operating rules through iteration with DSM2.
- Consider Project reservoir bio-productivity in subsequent water supply and water quality evaluations.
- Incorporate the following (and possibly other) refinements into subsequent DSM2 analyses:

✓ Through consultation with Contra Costa Water District, develop an operation schedule for the Los Vaqueros Reservoir Intake on Old River.
✓ Directly simulate UVA transport in DSM2.
✓ Allow Delta island consumptive use to vary between the Base and alternative scenarios.
✓ Evaluate and express DSM2 results as 14-day averages rather than as monthly averages.

## 2.6 References

California Department of Water Resources. (1995a). *Estimation of Delta Island Diversions and Return Flows.* Division of Planning. Sacramento, CA. February.

California Department of Water Resources. (1995b). *Representative Delta Island Return Flow Quality for DSM2.* Division of Planning. Sacramento, CA. May.

California Department of Water Resources. (2001). *Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh. Twenty-Second Annual Progress Report to the SWRCB, Chapters 3 and 10,* Office of State Water Project Planning. Sacramento, CA. August.

California Department of Water Resources. (2002). *Water Quality Modeling Technical Appendix, Integrated Storage Investigations In-Delta Storage Feasibility Study.* Office of State Water Project Planning. Sacramento, CA. May.

Hutton, P. and Chung, F. (1992). *Simulating THM Formation Potential in Sacramento Delta: Parts I and 2*. Journal of Water Resources Planning and Management, American Society of Civil Engineers, 118(5), 513-542.

Integrated Storage Investigations. (2002a)*. In-Delta Storage Feasibility Study Summary Report*, May.

Integrated Storage Investigations. (2002b)*. In-Delta Storage Feasibility Study Report on Operation Studies*, May.

Jones and Stokes Associates (2000*). Delta Wetlands Final Environmental Impact Report*, Sacramento, CA. May.

Jung and Associates (2000). *Revision of Representative Delta Island Return Flow Quality for DSM2 and DICU Model Runs, Municipal Water Quality Investigation Program*. Prepared for the California Department of Water Resources – Division of Planning and Local Assistance, Sacramento, CA. MWQI-CR#3, December.

Jung, M. (2001). *Email correspondence*, May 17 and June 1.

*Water Quality Management Plan.* (2000). Protest Dismissal Agreement between CCWD and Delta Wetlands Properties, Exhibit B. October.

**Appendix 2A: Graphical Model Results at Banks Pumping Plant**

**Figure 2A-1 Chloride Concentrations at Banks Pumping Plant**

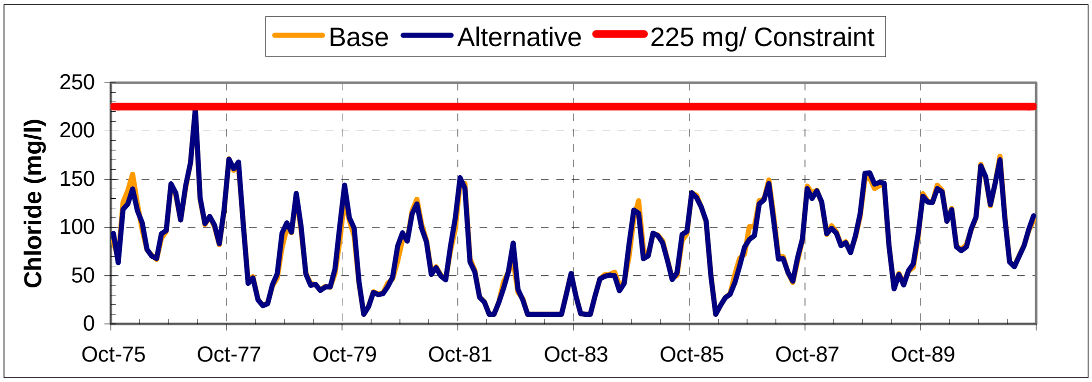



**Figure 2A-2 Change in Chloride Concentration at Banks Pumping Plant**

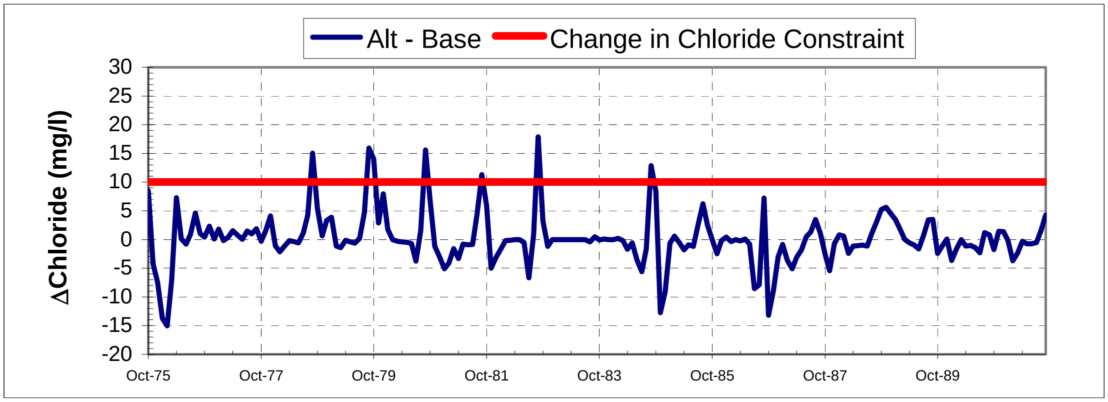
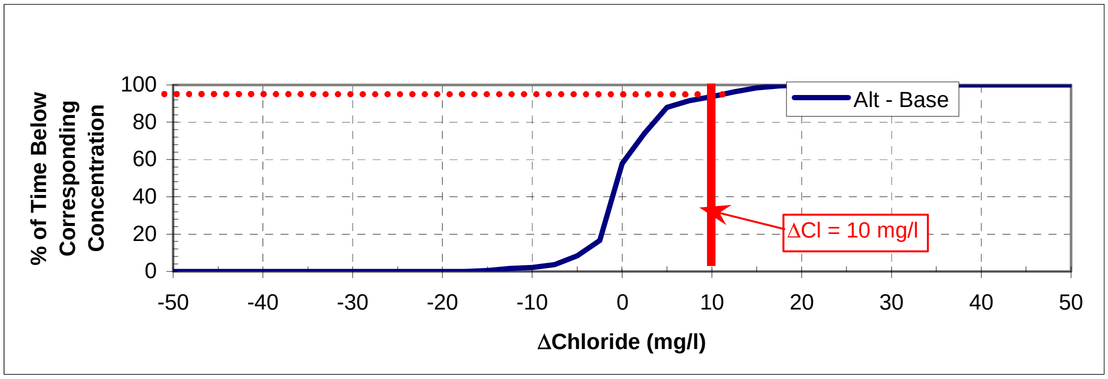
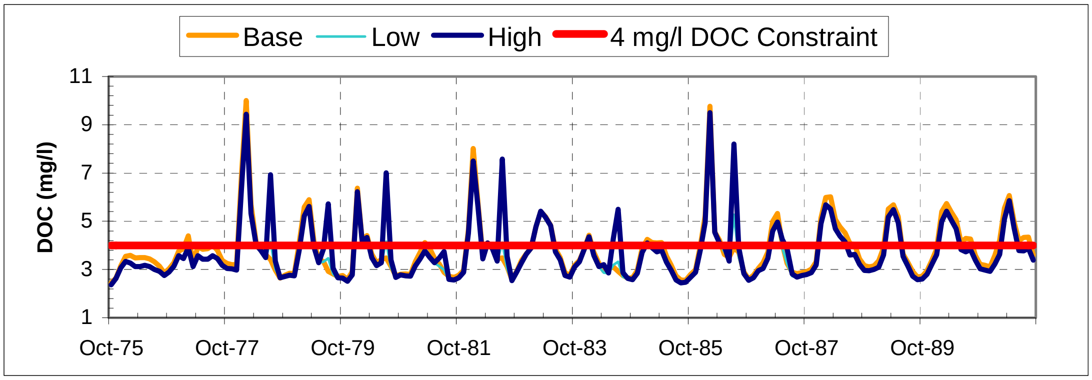


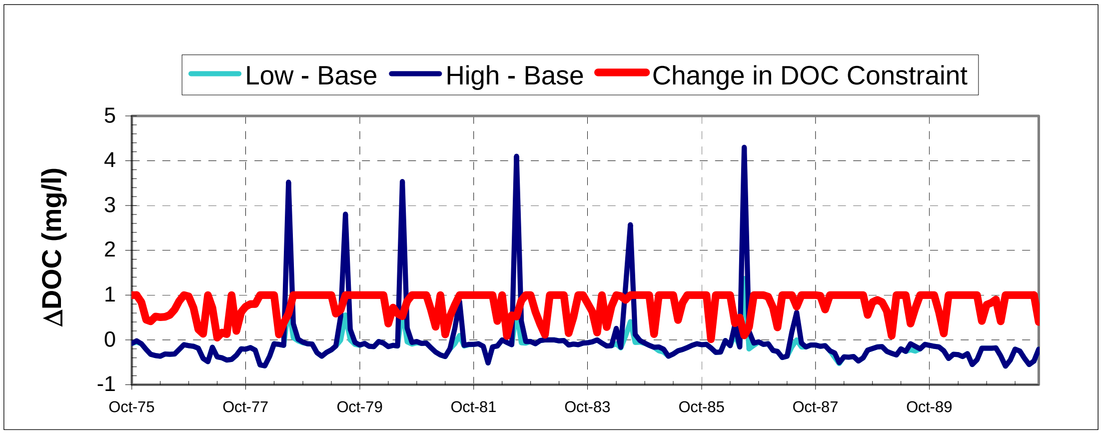

**Figure 2A-3 Cumulative Distribution of Chloride Change at Banks Pumping Plant**



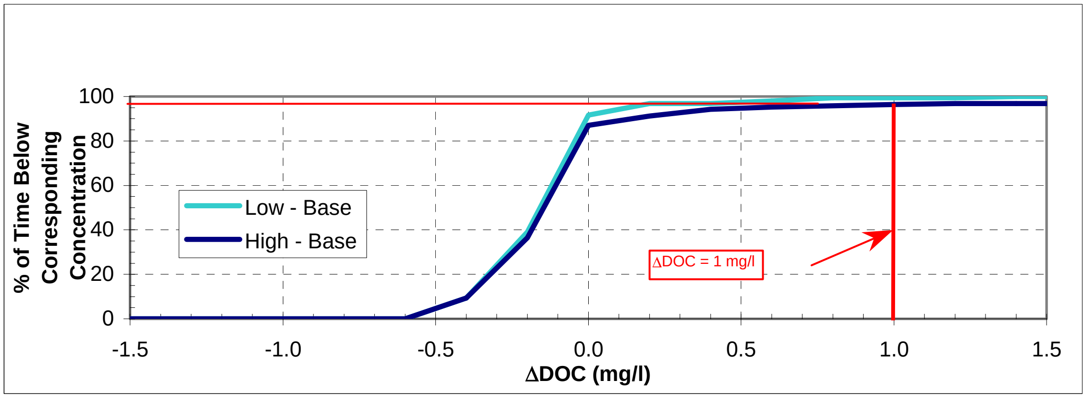
## Figure 2A-4 DOC Concentration at Banks Pumping Plant



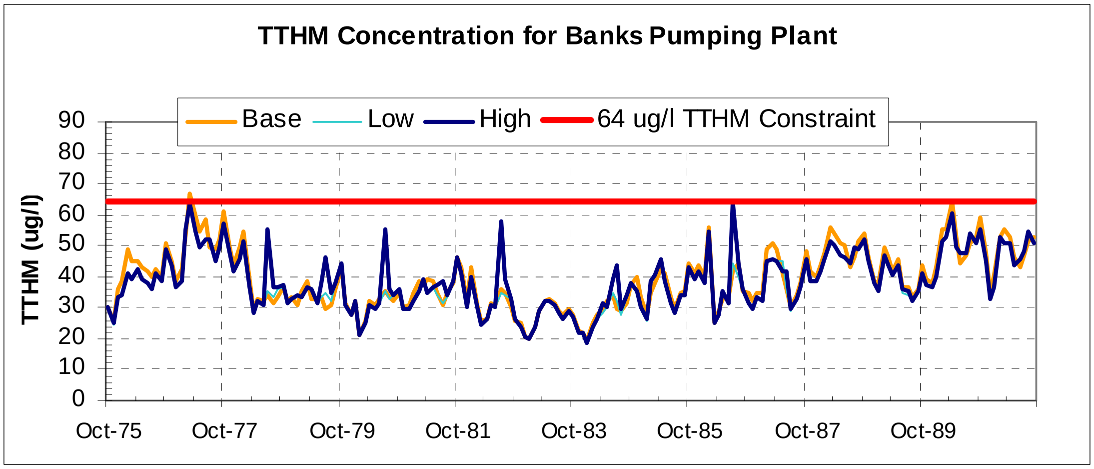

## Figure 2A-5 Change in DOC Concentration at Banks Pumping Plant



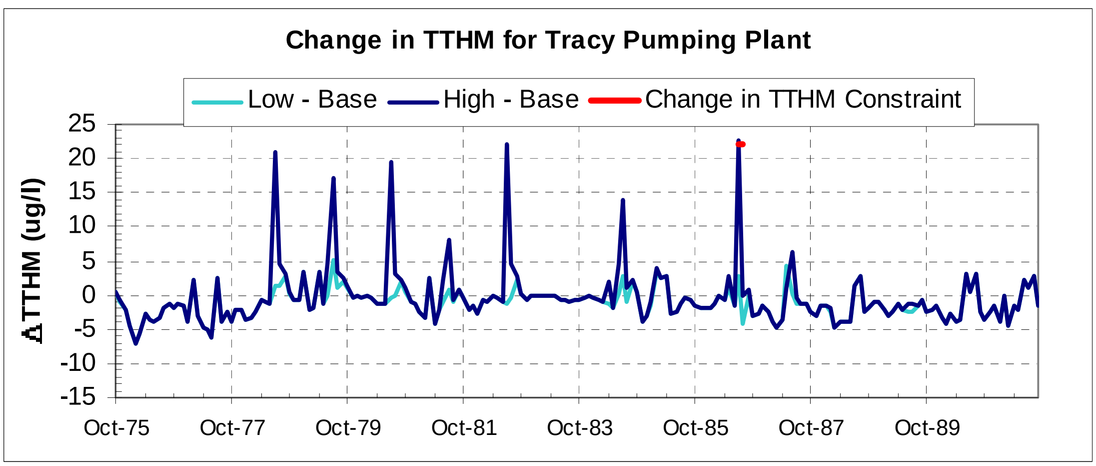

## Figure 2A-6 Cumulative Distribution of DOC Change at Banks Pumping Plant



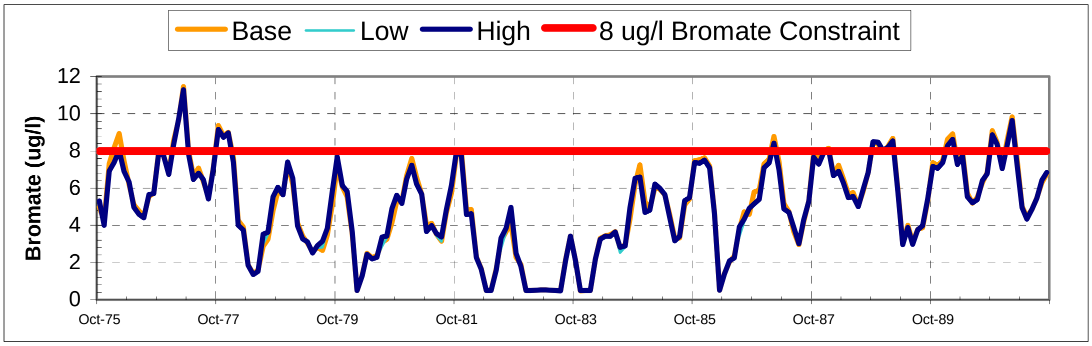
## Figure 2A-7 TTHM Concentration at Banks Pumping Plant




## Figure 2A-8 Change in TTHM Concentration at Banks Pumping Plant



## Figure 2A-9 Bromate Concentration at Banks Pumping Plant




## Figure 2A-10 Change in Bromate Concentration at Banks Pumping Plant

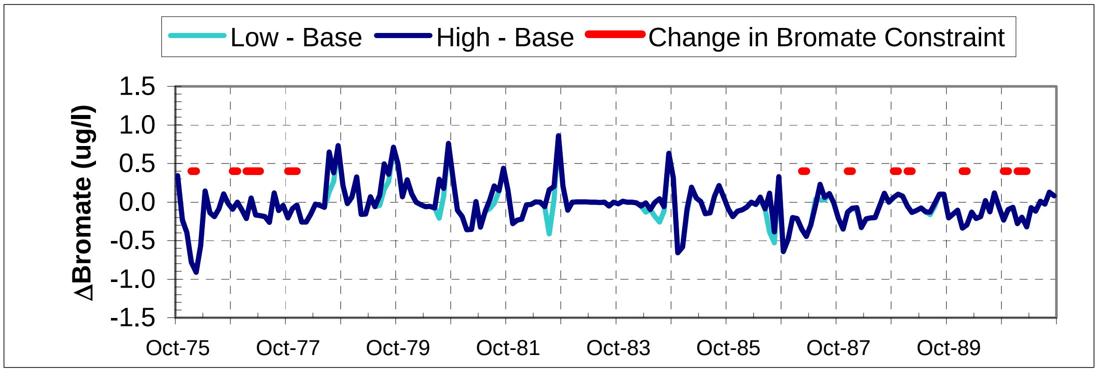


**Figure 2A-11 Long-Term Chloride Mass Loading at Banks Pumping Plant**

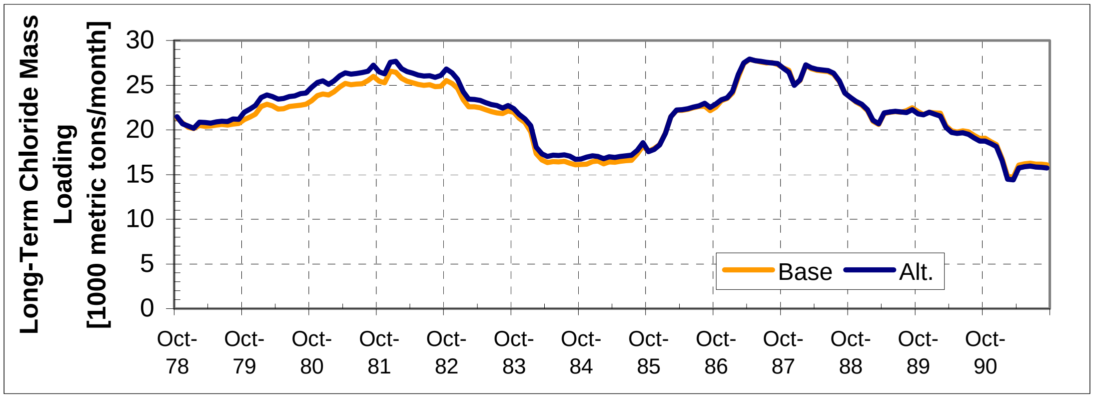



**Figure 2A-12 Change in Long-Term Chloride Mass Loading at Banks Pumping Plant**

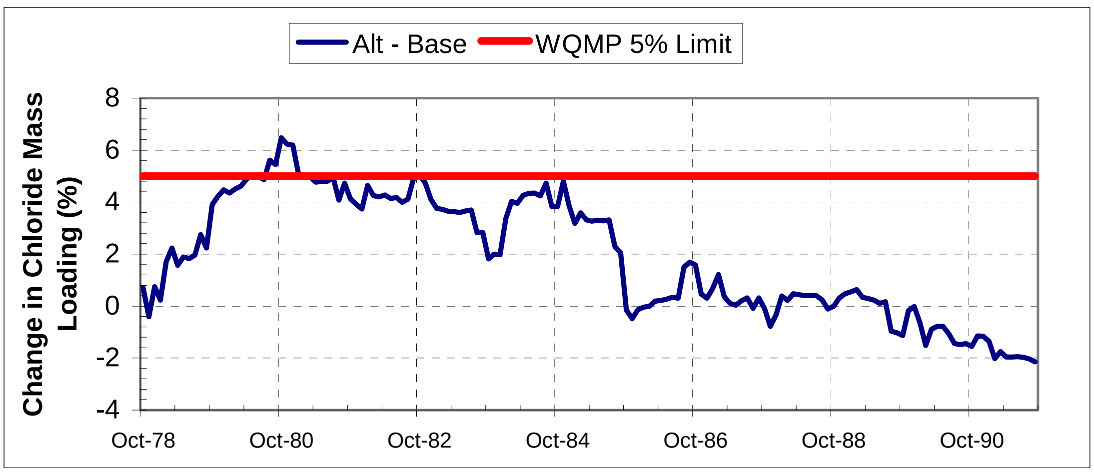



**Figure 2A-13 Cumulative Distribution of Long-Term Chloride Mass Loading Change at Banks Pumping Plant**

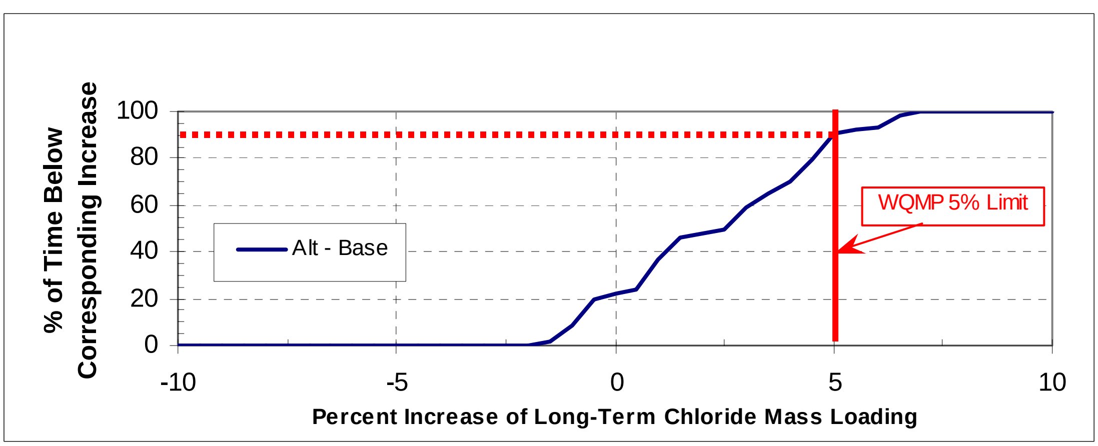


**Figure 2A-14 Long-Term DOC Mass Loading at Banks Pumping Plant**

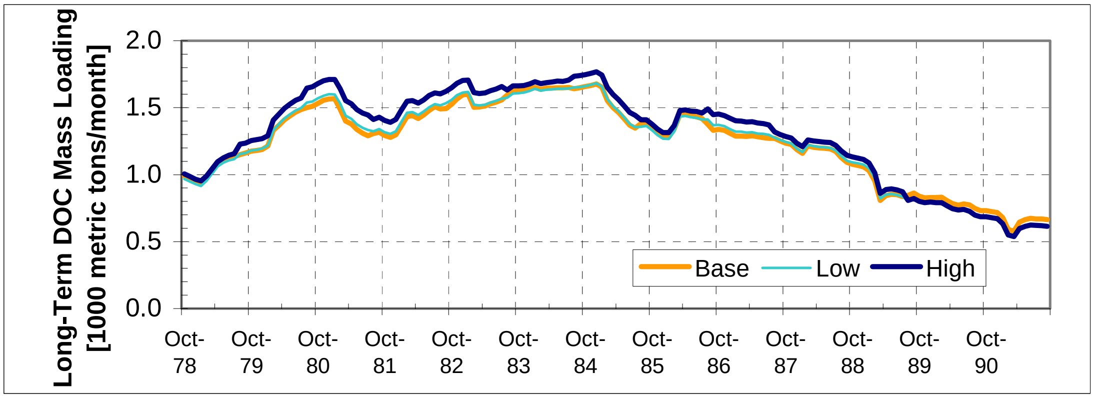



**Figure 2A-15 Change in Long-Term DOC Mass Loading at Banks Pumping Plant**

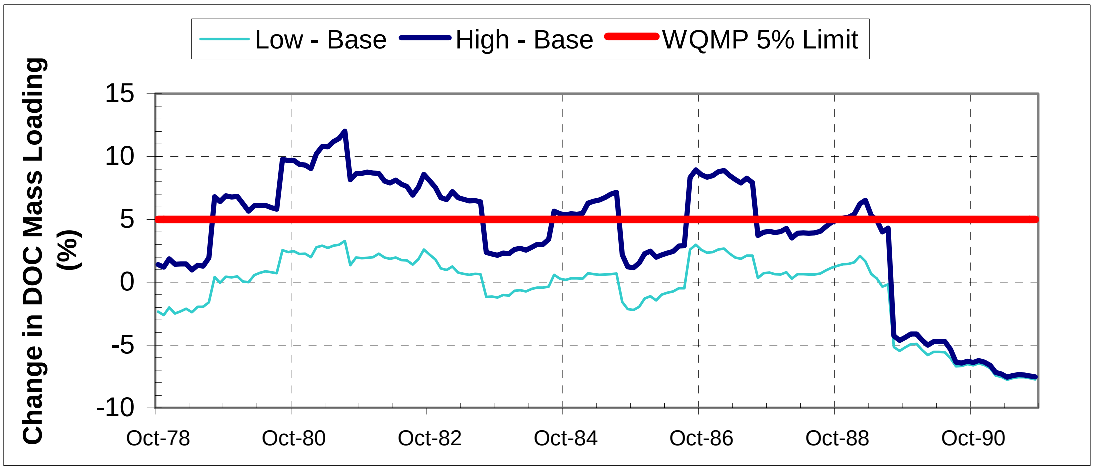
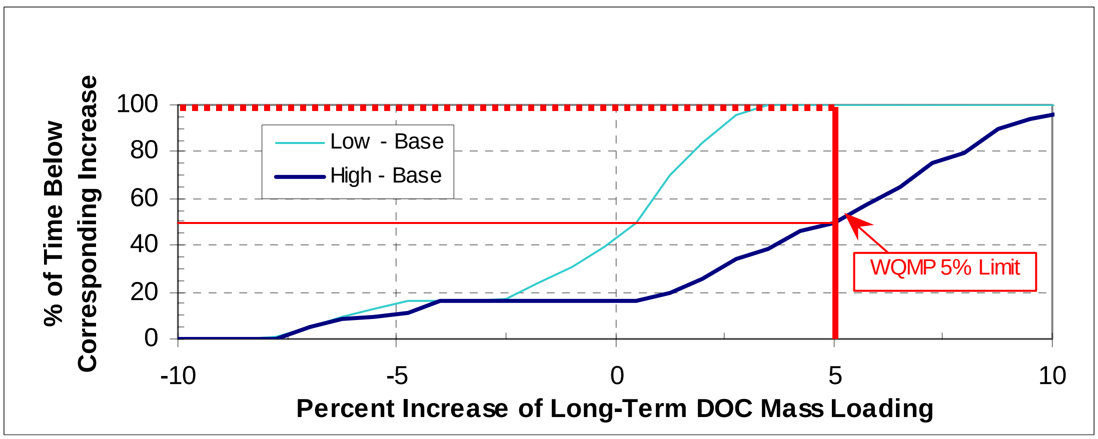



**Figure 2A-16 Cumulative Distribution of Long-Term DOC Mass Loading Change at Banks Pumping Plant**



**Appendix 2B: Tabular Model Results at Delta Urban Intakes**

Table 2B-1 Monthly Average Water Quality at
Rock Slough: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | n/a | n/a | 516 | 114 | 0.38 | 2.1 | 0.06 | 30 | 6.0 | n/a | n/a |
| ***Nov-75*** | n/a | n/a | 454 | 98 | 0.32 | 2.4 | 0.07 | 27 | 5.5 | n/a | n/a |
| Dec-75 | n/a | n/a | 758 | 179 | 0.61 | 2.9 | 0.09 | 42 | ***9.3*** | n/a | n/a |
| Jan-76 | n/a | n/a | 828 | 198 | 0.68 | 3.1 | 0.10 | 44 | ***10.3*** | n/a | n/a |
| Feb-76 | n/a | n/a | 797 | 190 | 0.65 | 3.0 | 0.09 | 48 | ***9.8*** | n/a | n/a |
| Mar-76 | n/a | n/a | 441 | 94 | 0.31 | 3.0 | 0.09 | 33 | 5.7 | n/a | n/a |
| Apr-76 | n/a | n/a | 319 | 61 | 0.19 | 3.0 | 0.10 | 32 | 4.1 | n/a | n/a |
| May-76 | n/a | n/a | 346 | 69 | 0.22 | 3.1 | 0.10 | 36 | 4.5 | n/a | n/a |
| Jun-76 | n/a | n/a | 380 | 78 | 0.25 | 2.7 | 0.08 | 35 | 4.8 | n/a | n/a |
| Jul-76 | n/a | n/a | 432 | 92 | 0.30 | 2.6 | 0.08 | 36 | 5.4 | n/a | n/a |
| Aug-76 | n/a | n/a | 556 | 125 | 0.42 | 2.5 | 0.07 | 41 | 6.8 | n/a | n/a |
| Sep-76 | n/a | n/a | 572 | 129 | 0.44 | 2.3 | 0.07 | 38 | 6.8 | n/a | n/a |
| Oct-76 | n/a | n/a | 813 | 194 | 0.67 | 2.5 | 0.07 | 52 | ***9.5*** | n/a | n/a |
| Nov-76 | n/a | n/a | 754 | 178 | 0.61 | 2.5 | 0.07 | 43 | ***8.8*** | n/a | n/a |
| Dec-76 | n/a | n/a | 566 | 128 | 0.43 | 2.4 | 0.07 | 28 | 6.8 | n/a | n/a |
| Jan-77 | n/a | n/a | 838 | 201 | 0.69 | 2.9 | 0.09 | 42 | ***10.2*** | n/a | n/a |
| Feb-77 | n/a | n/a | 849 | 204 | 0.70 | 3.5 | 0.12 | 59 | ***10.9*** | n/a | n/a |
| Mar-77 | n/a | n/a | 596 | 136 | 0.46 | 4.1 | 0.14 | 48 | ***8.1*** | n/a | n/a |
| Apr-77 | n/a | n/a | 401 | 83 | 0.27 | 3.1 | 0.10 | 38 | 5.3 | n/a | n/a |
| May-77 | n/a | n/a | 435 | 93 | 0.30 | 3.1 | 0.10 | 42 | 5.7 | n/a | n/a |
| Jun-77 | n/a | n/a | 583 | 132 | 0.45 | 3.2 | 0.10 | 55 | 7.6 | n/a | n/a |
| Jul-77 | n/a | n/a | 521 | 116 | 0.39 | 3.0 | 0.10 | 48 | 6.8 | n/a | n/a |
| Aug-77 | n/a | n/a | 439 | 94 | 0.31 | 2.9 | 0.09 | 41 | 5.6 | n/a | n/a |
| Sep-77 | n/a | n/a | 736 | 173 | 0.59 | 2.6 | 0.08 | 54 | ***8.9*** | n/a | n/a |
| Oct-77 | n/a | n/a | 938 | ***227*** | 0.79 | 2.6 | 0.08 | 63 | ***10.9*** | n/a | n/a |
| Nov-77 | n/a | n/a | 821 | 196 | 0.68 | 2.6 | 0.08 | 48 | ***9.7*** | n/a | n/a |
| Dec-77 | n/a | n/a | 965 | ***235*** | 0.81 | 2.9 | 0.09 | 55 | ***11.5*** | n/a | n/a |
| Jan-78 | n/a | n/a | 502 | 111 | 0.37 | 6.0 | 0.23 | 46 | 7.7 | n/a | n/a |
| Feb-78 | n/a | n/a | 306 | 58 | 0.18 | 7.3 | 0.28 | 46 | 4.9 | n/a | n/a |
| Mar-78 | n/a | n/a | 300 | 57 | 0.17 | 6.5 | 0.25 | 46 | 4.6 | n/a | n/a |
| Apr-78 | n/a | n/a | 261 | 51 | 0.16 | 4.3 | 0.15 | 36 | 3.7 | n/a | n/a |
| May-78 | n/a | n/a | 223 | 36 | 0.10 | 3.5 | 0.12 | 34 | 2.7 | n/a | n/a |
| Jun-78 | n/a | n/a | 229 | 37 | 0.11 | 3.3 | 0.11 | 33 | 2.7 | n/a | n/a |
| ***Jul-78*** | n/a | n/a | 240 | 41 | 0.12 | 2.7 | 0.08 | 28 | 2.8 | n/a | n/a |
| Aug-78 | n/a | n/a | 291 | 54 | 0.17 | 2.4 | 0.07 | 27 | 3.4 | n/a | n/a |
| Sep-78 | n/a | n/a | 484 | 106 | 0.35 | 2.2 | 0.06 | 32 | 5.7 | n/a | n/a |
| ***Oct-78*** | n/a | n/a | 620 | 142 | 0.48 | 2.2 | 0.06 | 37 | 7.2 | 1.73 | 0.05 |
| Nov-78 | n/a | n/a | 630 | 145 | 0.49 | 2.3 | 0.07 | 33 | 7.4 | 1.80 | 0.05 |
| Dec-78 | n/a | n/a | 780 | 185 | 0.64 | 2.3 | 0.07 | 35 | ***8.9*** | 1.82 | 0.05 |
| Jan-79 | n/a | n/a | 608 | 139 | 0.47 | 3.5 | 0.12 | 38 | ***8.2*** | 1.83 | 0.05 |
| Feb-79 | n/a | n/a | 370 | 75 | 0.24 | 5.6 | 0.21 | 41 | 5.6 | 1.81 | 0.05 |
| Mar-79 | n/a | n/a | 272 | 49 | 0.15 | 4.9 | 0.18 | 34 | 3.7 | 1.79 | 0.05 |
| Apr-79 | n/a | n/a | 349 | 43 | 0.13 | 3.2 | 0.10 | 30 | 3.0 | 1.77 | 0.05 |
| May-79 | n/a | n/a | 259 | 45 | 0.14 | 3.2 | 0.10 | 33 | 3.2 | 1.77 | 0.05 |
| ***Jun-79*** | n/a | n/a | 240 | 40 | 0.12 | 2.8 | 0.09 | 28 | 2.8 | 1.77 | 0.05 |
| ***Jul-79*** | n/a | n/a | 262 | 46 | 0.14 | 2.4 | 0.07 | 26 | 3.0 | 1.77 | 0.05 |
| Aug-79 | n/a | n/a | 333 | 65 | 0.21 | 2.3 | 0.07 | 28 | 3.9 | 1.77 | 0.05 |
| Sep-79 | n/a | n/a | 535 | 119 | 0.40 | 2.3 | 0.06 | 36 | 6.3 | 1.78 | 0.05 |
| Oct-79 | n/a | n/a | 736 | 173 | 0.59 | 2.2 | 0.06 | 43 | ***8.4*** | 1.77 | 0.05 |
| Nov-79 | n/a | n/a | 606 | 138 | 0.47 | 2.3 | 0.06 | 32 | 7.1 | 1.76 | 0.05 |
| Dec-79 | n/a | n/a | 541 | 121 | 0.41 | 2.7 | 0.08 | 30 | 6.7 | 1.79 | 0.05 |
| Jan-80 | n/a | n/a | 436 | 93 | 0.30 | 5.6 | 0.21 | 39 | 6.6 | 1.81 | 0.05 |
| Feb-80 | n/a | n/a | 295 | 55 | 0.17 | 7.2 | 0.28 | 45 | 4.6 | 1.78 | 0.05 |
| Mar-80 | n/a | n/a | 188 | 26 | 0.07 | 4.4 | 0.16 | 27 | 2.0 | 1.72 | 0.05 |
| Apr-80 | n/a | n/a | 251 | 43 | 0.13 | 3.5 | 0.12 | 33 | 3.1 | 1.67 | 0.05 |
| May-80 | n/a | n/a | 250 | 43 | 0.13 | 3.0 | 0.09 | 30 | 3.0 | 1.64 | 0.05 |
| Jun-80 | n/a | n/a | 248 | 43 | 0.12 | 3.0 | 0.10 | 31 | 3.0 | 1.62 | 0.05 |
| ***Jul-80*** | n/a | n/a | 252 | 44 | 0.13 | 2.8 | 0.09 | 29 | 2.9 | 1.59 | 0.05 |
| Aug-80 | n/a | n/a | 262 | 46 | 0.14 | 2.5 | 0.07 | 26 | 3.0 | 1.54 | 0.05 |
| Sep-80 | n/a | n/a | 391 | 81 | 0.26 | 2.3 | 0.06 | 29 | 4.6 | 1.52 | 0.05 |
| ***Oct-80*** | n/a | n/a | 551 | 124 | 0.42 | 2.3 | 0.06 | 34 | 6.5 | 1.47 | 0.05 |
| Nov-80 | n/a | n/a | 552 | 124 | 0.42 | 2.3 | 0.06 | 30 | 6.5 | 1.41 | 0.05 |
| Dec-80 | n/a | n/a | 689 | 161 | 0.55 | 2.4 | 0.07 | 32 | ***8.1*** | 1.38 | 0.05 |
| Jan-81 | n/a | n/a | 817 | 195 | 0.67 | 2.8 | 0.09 | 41 | ***9.9*** | 1.35 | 0.05 |
| Feb-81 | n/a | n/a | 404 | 84 | 0.27 | 3.3 | 0.11 | 31 | 5.4 | 1.36 | 0.05 |
| Mar-81 | n/a | n/a | 257 | 45 | 0.13 | 3.6 | 0.12 | 30 | 3.3 | 1.38 | 0.05 |

Table 2B-1 Monthly Average Water Quality at
Rock Slough: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | n/a | n/a | 247 | 42 | 0.12 | 3.2 | 0.11 | 31 | 3.0 | 1.36 | 0.05 |
| ***May-81*** | n/a | n/a | 310 | 59 | 0.18 | 3.2 | 0.11 | 36 | 4.0 | 1.35 | 0.05 |
| ***Jun-81*** | n/a | n/a | 288 | 53 | 0.16 | 2.7 | 0.08 | 30 | 3.5 | 1.36 | 0.05 |
| ***Jul-81*** | n/a | n/a | 334 | 66 | 0.21 | 2.4 | 0.07 | 29 | 4.0 | 1.38 | 0.05 |
| Aug-81 | n/a | n/a | 501 | 110 | 0.37 | 2.3 | 0.07 | 35 | 6.0 | 1.38 | 0.05 |
| Sep-81 | n/a | n/a | 610 | 140 | 0.47 | 2.2 | 0.06 | 39 | 7.1 | 1.41 | 0.04 |
| Oct-81 | n/a | n/a | 808 | 192 | 0.66 | 2.2 | 0.06 | 46 | ***9.1*** | 1.38 | 0.04 |
| Nov-81 | n/a | n/a | 802 | 191 | 0.66 | 2.7 | 0.08 | 49 | ***9.6*** | 1.35 | 0.04 |
| Dec-81 | n/a | n/a | 339 | 67 | 0.21 | 5.0 | 0.18 | 34 | 4.9 | 1.37 | 0.04 |
| Jan-82 | n/a | n/a | 294 | 55 | 0.17 | 5.4 | 0.20 | 31 | 4.2 | 1.33 | 0.04 |
| Feb-82 | n/a | n/a | 305 | 58 | 0.18 | 5.5 | 0.20 | 36 | 4.4 | 1.30 | 0.04 |
| Mar-82 | n/a | n/a | 310 | 59 | 0.18 | 6.2 | 0.24 | 45 | 4.7 | 1.30 | 0.04 |
| Apr-82 | n/a | n/a | 228 | 37 | 0.11 | 4.9 | 0.18 | 37 | 2.9 | 1.29 | 0.04 |
| May-82 | n/a | n/a | 186 | 26 | 0.06 | 3.8 | 0.13 | 34 | 2.0 | 1.29 | 0.04 |
| Jun-82 | n/a | n/a | 220 | 35 | 0.10 | 3.0 | 0.10 | 30 | 2.5 | 1.28 | 0.04 |
| ***Jul-82*** | n/a | n/a | 247 | 42 | 0.12 | 2.8 | 0.09 | 29 | 2.9 | 1.27 | 0.04 |
| Aug-82 | n/a | n/a | 284 | 52 | 0.16 | 2.5 | 0.07 | 27 | 3.3 | 1.27 | 0.04 |
| Sep-82 | n/a | n/a | 387 | 80 | 0.26 | 2.1 | 0.06 | 27 | 4.5 | 1.26 | 0.04 |
| Oct-82 | n/a | n/a | 274 | 49 | 0.15 | 2.4 | 0.07 | 24 | 3.2 | 1.24 | 0.04 |
| Nov-82 | n/a | n/a | 234 | 39 | 0.11 | 3.3 | 0.11 | 26 | 2.8 | 1.18 | 0.04 |
| Dec-82 | n/a | n/a | 289 | 54 | 0.16 | 4.8 | 0.17 | 30 | 4.0 | 1.14 | 0.04 |
| Jan-83 | n/a | n/a | 301 | 57 | 0.18 | 5.1 | 0.19 | 29 | 4.3 | 1.12 | 0.04 |
| Feb-83 | n/a | n/a | 139 | 13 | 0.02 | 4.9 | 0.18 | 25 | 0.9 | 1.11 | 0.04 |
| Mar-83 | n/a | n/a | 170 | 21 | 0.05 | 5.5 | 0.20 | 32 | 1.7 | 1.11 | 0.04 |
| Apr-83 | n/a | n/a | 192 | 28 | 0.07 | 5.4 | 0.20 | 38 | 2.3 | 1.11 | 0.04 |
| May-83 | n/a | n/a | 198 | 29 | 0.08 | 5.3 | 0.19 | 40 | 2.4 | 1.11 | 0.04 |
| Jun-83 | n/a | n/a | 144 | 15 | 0.02 | 3.7 | 0.13 | 31 | 1.0 | 1.10 | 0.05 |
| Jul-83 | n/a | n/a | 183 | 25 | 0.06 | 3.3 | 0.11 | 30 | 1.8 | 1.08 | 0.05 |
| Aug-83 | n/a | n/a | 245 | 42 | 0.12 | 2.4 | 0.07 | 25 | 2.7 | 1.08 | 0.05 |
| Sep-83 | n/a | n/a | 289 | 53 | 0.16 | 2.2 | 0.06 | 24 | 3.3 | 1.06 | 0.05 |
| Oct-83 | n/a | n/a | 238 | 40 | 0.12 | 2.8 | 0.09 | 26 | 2.7 | 1.05 | 0.05 |
| Nov-83 | n/a | n/a | 209 | 32 | 0.09 | 3.5 | 0.12 | 27 | 2.4 | 1.01 | 0.05 |
| Dec-83 | n/a | n/a | 158 | 18 | 0.04 | 4.0 | 0.14 | 30 | 1.3 | 0.97 | 0.05 |
| Jan-84 | n/a | n/a | 170 | 22 | 0.05 | 4.6 | 0.17 | 21 | 1.6 | 0.93 | 0.05 |
| Feb-84 | n/a | n/a | 239 | 40 | 0.12 | 3.7 | 0.13 | 27 | 3.0 | 0.88 | 0.05 |
| Mar-84 | n/a | n/a | 242 | 41 | 0.12 | 2.9 | 0.09 | 23 | 2.8 | 0.87 | 0.05 |
| ***Apr-84*** | n/a | n/a | 248 | 42 | 0.12 | 2.4 | 0.07 | 23 | 2.8 | 0.87 | 0.05 |
| May-84 | n/a | n/a | 295 | 55 | 0.17 | 2.7 | 0.08 | 30 | 3.6 | 0.87 | 0.05 |
| ***Jun-84*** | n/a | n/a | 264 | 47 | 0.14 | 2.5 | 0.07 | 27 | 3.0 | 0.87 | 0.05 |
| ***Jul-84*** | n/a | n/a | 246 | 42 | 0.12 | 2.4 | 0.07 | 25 | 2.7 | 0.87 | 0.05 |
| Aug-84 | n/a | n/a | 270 | 48 | 0.15 | 2.3 | 0.06 | 24 | 3.0 | 0.85 | 0.05 |
| Sep-84 | n/a | n/a | 412 | 86 | 0.28 | 2.2 | 0.06 | 29 | 4.9 | 0.81 | 0.05 |
| Oct-84 | n/a | n/a | 612 | 140 | 0.47 | 2.2 | 0.06 | 36 | 7.1 | 0.78 | 0.05 |
| Nov-84 | n/a | n/a | 759 | 179 | 0.62 | 2.7 | 0.08 | 46 | ***9.2*** | 0.75 | 0.05 |
| Dec-84 | n/a | n/a | 400 | 83 | 0.27 | 3.6 | 0.12 | 32 | 5.5 | 0.75 | 0.05 |
| ***Jan-85*** | n/a | n/a | 371 | 76 | 0.24 | 3.7 | 0.13 | 29 | 5.1 | 0.75 | 0.05 |
| ***Feb-85*** | n/a | n/a | 415 | 87 | 0.28 | 3.5 | 0.12 | 33 | 5.6 | 0.76 | 0.05 |
| Mar-85 | n/a | n/a | 316 | 61 | 0.19 | 3.4 | 0.12 | 31 | 4.2 | 0.76 | 0.05 |
| Apr-85 | n/a | n/a | 288 | 53 | 0.16 | 3.4 | 0.11 | 34 | 3.7 | 0.77 | 0.05 |
| May-85 | n/a | n/a | 314 | 60 | 0.19 | 3.2 | 0.10 | 36 | 4.0 | 0.77 | 0.05 |
| Jun-85 | n/a | n/a | 268 | 48 | 0.14 | 2.6 | 0.08 | 28 | 3.1 | 0.79 | 0.05 |
| ***Jul-85*** | n/a | n/a | 377 | 77 | 0.25 | 2.4 | 0.07 | 30 | 4.5 | 0.80 | 0.05 |
| Aug-85 | n/a | n/a | 568 | 128 | 0.43 | 2.2 | 0.06 | 37 | 6.7 | 0.82 | 0.05 |
| Sep-85 | n/a | n/a | 572 | 129 | 0.44 | 2.2 | 0.06 | 36 | 6.7 | 0.87 | 0.05 |
| Oct-85 | n/a | n/a | 716 | 168 | 0.57 | 2.3 | 0.06 | 42 | ***8.3*** | 0.90 | 0.05 |
| Nov-85 | n/a | n/a | 710 | 166 | 0.57 | 2.3 | 0.07 | 37 | ***8.3*** | 0.96 | 0.05 |
| Dec-85 | n/a | n/a | 621 | 142 | 0.48 | 3.3 | 0.11 | 40 | ***8.1*** | 1.00 | 0.05 |
| Jan-86 | n/a | n/a | 596 | 136 | 0.46 | 4.7 | 0.17 | 42 | ***8.4*** | 1.02 | 0.04 |
| Feb-86 | n/a | n/a | 360 | 73 | 0.23 | 8.4 | 0.33 | 57 | 6.1 | 1.04 | 0.04 |
| Mar-86 | n/a | n/a | 190 | 27 | 0.07 | 6.1 | 0.23 | 36 | 2.3 | 1.05 | 0.04 |
| Apr-86 | n/a | n/a | 231 | 38 | 0.11 | 4.5 | 0.16 | 34 | 2.9 | 1.05 | 0.05 |
| ***May-86*** | n/a | n/a | 242 | 41 | 0.12 | 3.5 | 0.12 | 35 | 3.0 | 1.05 | 0.05 |
| Jun-86 | n/a | n/a | 255 | 44 | 0.13 | 3.2 | 0.10 | 33 | 3.1 | 1.06 | 0.04 |
| ***Jul-86*** | n/a | n/a | 276 | 50 | 0.15 | 3.2 | 0.11 | 35 | 3.5 | 1.08 | 0.04 |
| Aug-86 | n/a | n/a | 276 | 50 | 0.15 | 2.9 | 0.09 | 31 | 3.3 | 1.10 | 0.04 |
| Sep-86 | n/a | n/a | 383 | 79 | 0.25 | 2.4 | 0.07 | 30 | 4.6 | 1.10 | 0.04 |

Table 2B-1 Monthly Average Water Quality at
Rock Slough: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | n/a | n/a | 585 | 133 | 0.45 | 2.2 | 0.06 | 34 | 6.8 | 1.12 | 0.04 |
| Nov-86 | n/a | n/a | 585 | 133 | 0.45 | 2.3 | 0.06 | 31 | 6.9 | 1.16 | 0.04 |
| Dec-86 | n/a | n/a | 782 | 186 | 0.64 | 2.4 | 0.07 | 36 | ***9.1*** | 1.20 | 0.04 |
| Jan-87 | n/a | n/a | 733 | 172 | 0.59 | 2.8 | 0.09 | 36 | ***9.0*** | 1.25 | 0.04 |
| Feb-87 | n/a | n/a | 749 | 177 | 0.61 | 3.7 | 0.12 | 55 | ***10.0*** | 1.29 | 0.04 |
| Mar-87 | n/a | n/a | 344 | 68 | 0.22 | 5.1 | 0.19 | 40 | 5.0 | 1.31 | 0.04 |
| Apr-87 | n/a | n/a | 258 | 45 | 0.13 | 4.7 | 0.17 | 37 | 3.4 | 1.32 | 0.04 |
| ***May-87*** | n/a | n/a | 299 | 56 | 0.17 | 3.4 | 0.11 | 37 | 3.9 | 1.32 | 0.04 |
| ***Jun-87*** | n/a | n/a | 274 | 50 | 0.15 | 2.6 | 0.08 | 28 | 3.2 | 1.32 | 0.04 |
| ***Jul-87*** | n/a | n/a | 308 | 59 | 0.18 | 2.4 | 0.07 | 27 | 3.6 | 1.32 | 0.04 |
| Aug-87 | n/a | n/a | 431 | 82 | 0.30 | 2.3 | 0.07 | 32 | 5.2 | 1.33 | 0.04 |
| Sep-87 | n/a | n/a | 533 | 119 | 0.40 | 2.4 | 0.07 | 37 | 6.4 | 1.36 | 0.04 |
| Oct-87 | n/a | n/a | 756 | 179 | 0.61 | 2.4 | 0.07 | 47 | ***8.8*** | 1.38 | 0.04 |
| Nov-87 | n/a | n/a | 732 | 172 | 0.59 | 2.4 | 0.07 | 39 | ***8.5*** | 1.35 | 0.04 |
| Dec-87 | n/a | n/a | 804 | 191 | 0.66 | 2.9 | 0.09 | 46 | ***9.9*** | 1.31 | 0.04 |
| Jan-88 | n/a | n/a | 647 | 149 | 0.51 | 5.0 | 0.18 | 47 | ***9.2*** | 1.32 | 0.04 |
| ***Feb-88*** | n/a | n/a | 329 | 64 | 0.20 | 5.1 | 0.19 | 35 | 4.7 | 1.34 | 0.04 |
| Mar-88 | n/a | n/a | 287 | 53 | 0.16 | 3.8 | 0.13 | 33 | 3.8 | 1.33 | 0.04 |
| Apr-88 | n/a | n/a | 310 | 59 | 0.18 | 3.4 | 0.11 | 35 | 4.1 | 1.33 | 0.04 |
| May-88 | n/a | n/a | 347 | 69 | 0.22 | 3.7 | 0.12 | 43 | 4.7 | 1.33 | 0.04 |
| Jun-88 | n/a | n/a | 385 | 79 | 0.26 | 3.3 | 0.11 | 43 | 5.2 | 1.33 | 0.04 |
| Jul-88 | n/a | n/a | 389 | 80 | 0.26 | 3.1 | 0.10 | 40 | 5.1 | 1.34 | 0.04 |
| Aug-88 | n/a | n/a | 510 | 113 | 0.38 | 3.1 | 0.10 | 48 | 6.7 | 1.31 | 0.04 |
| Sep-88 | n/a | n/a | 654 | 151 | 0.51 | 2.7 | 0.08 | 50 | ***8.0*** | 1.27 | 0.04 |
| Oct-88 | n/a | n/a | 782 | 186 | 0.64 | 2.6 | 0.08 | 52 | ***9.2*** | 1.23 | 0.04 |
| Nov-88 | n/a | n/a | 828 | 198 | 0.68 | 2.5 | 0.07 | 47 | ***9.7*** | 1.23 | 0.04 |
| Dec-88 | n/a | n/a | 799 | 190 | 0.65 | 2.4 | 0.07 | 38 | ***9.3*** | 1.26 | 0.04 |
| Jan-89 | n/a | n/a | 766 | 181 | 0.62 | 2.7 | 0.08 | 36 | ***9.2*** | 1.27 | 0.04 |
| Feb-89 | n/a | n/a | 561 | 126 | 0.42 | 3.4 | 0.11 | 40 | 7.5 | 1.28 | 0.04 |
| Mar-89 | n/a | n/a | 357 | 72 | 0.23 | 4.6 | 0.17 | 38 | 5.0 | 1.30 | 0.04 |
| Apr-89 | n/a | n/a | 237 | 39 | 0.11 | 5.3 | 0.20 | 40 | 3.3 | 1.31 | 0.04 |
| May-89 | n/a | n/a | 251 | 43 | 0.13 | 4.4 | 0.15 | 37 | 3.2 | 1.31 | 0.04 |
| ***Jun-89*** | n/a | n/a | 256 | 45 | 0.13 | 2.8 | 0.09 | 29 | 3.0 | 1.32 | 0.04 |
| ***Jul-89*** | n/a | n/a | 364 | 74 | 0.24 | 2.6 | 0.08 | 33 | 4.5 | 1.32 | 0.04 |
| Aug-89 | n/a | n/a | 405 | 84 | 0.27 | 2.4 | 0.07 | 32 | 4.9 | 1.36 | 0.04 |
| Sep-89 | n/a | n/a | 566 | 128 | 0.43 | 2.2 | 0.06 | 37 | 6.7 | 1.42 | 0.04 |
| Oct-89 | n/a | n/a | 730 | 172 | 0.59 | 2.3 | 0.06 | 43 | ***8.4*** | 1.45 | 0.04 |
| Nov-89 | n/a | n/a | 655 | 152 | 0.52 | 2.4 | 0.07 | 36 | 7.8 | 1.46 | 0.04 |
| Dec-89 | n/a | n/a | 679 | 158 | 0.54 | 2.6 | 0.08 | 35 | ***8.3*** | 1.47 | 0.04 |
| Jan-90 | n/a | n/a | 850 | 204 | 0.70 | 3.6 | 0.12 | 52 | ***11.0*** | 1.46 | 0.04 |
| Feb-90 | n/a | n/a | 593 | 135 | 0.46 | 4.5 | 0.16 | 47 | ***8.3*** | 1.47 | 0.04 |
| Mar-90 | n/a | n/a | 325 | 63 | 0.20 | 3.9 | 0.14 | 36 | 4.5 | 1.46 | 0.04 |
| Apr-90 | n/a | n/a | 329 | 64 | 0.20 | 4.1 | 0.14 | 37 | 4.4 | 1.47 | 0.04 |
| May-90 | n/a | n/a | 356 | 71 | 0.23 | 4.2 | 0.15 | 43 | 4.9 | 1.47 | 0.04 |
| Jun-90 | n/a | n/a | 395 | 82 | 0.27 | 3.2 | 0.11 | 42 | 5.3 | 1.48 | 0.04 |
| Jul-90 | n/a | n/a | 427 | 90 | 0.30 | 3.3 | 0.11 | 45 | 5.7 | 1.48 | 0.04 |
| Aug-90 | n/a | n/a | 551 | 124 | 0.42 | 3.3 | 0.11 | 54 | 7.3 | 1.48 | 0.04 |
| Sep-90 | n/a | n/a | 661 | 153 | 0.52 | 2.8 | 0.09 | 51 | ***8.2*** | 1.48 | 0.04 |
| Oct-90 | n/a | n/a | 941 | ***228*** | 0.79 | 2.6 | 0.08 | 63 | ***10.9*** | 1.47 | 0.04 |
| Nov-90 | n/a | n/a | 726 | 170 | 0.58 | 2.5 | 0.07 | 41 | ***8.6*** | 1.52 | 0.04 |
| Dec-90 | n/a | n/a | 619 | 142 | 0.48 | 2.6 | 0.08 | 33 | 7.5 | 1.56 | 0.04 |
| Jan-91 | n/a | n/a | 886 | 213 | 0.74 | 3.3 | 0.11 | 51 | ***11.2*** | 1.57 | 0.04 |
| Feb-91 | n/a | n/a | 888 | 214 | 0.74 | 3.8 | 0.13 | ***67*** | ***11.7*** | 1.60 | 0.04 |
| Mar-91 | n/a | n/a | 480 | 105 | 0.35 | 4.7 | 0.17 | 46 | 6.8 | 1.65 | 0.04 |
| Apr-91 | n/a | n/a | 273 | 49 | 0.15 | 5.2 | 0.19 | 42 | 3.8 | 1.69 | 0.05 |
| May-91 | n/a | n/a | 301 | 57 | 0.18 | 4.0 | 0.14 | 37 | 4.0 | 1.70 | 0.05 |
| Jun-91 | n/a | n/a | 368 | 75 | 0.24 | 3.3 | 0.11 | 41 | 4.9 | 1.70 | 0.05 |
| Jul-91 | n/a | n/a | 410 | 86 | 0.28 | 3.3 | 0.11 | 44 | 5.5 | 1.69 | 0.05 |
| Aug-91 | n/a | n/a | 562 | 127 | 0.43 | 3.3 | 0.11 | 55 | 7.5 | 1.72 | 0.05 |
| Sep-91 | n/a | n/a | 670 | 156 | 0.53 | 2.8 | 0.09 | 52 | ***8.3*** | 1.74 | 0.05 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-2 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | n/a | n/a | 496 | 92 | 0.31 | 2.3 | 0.06 | 29 | 5.1 | n/a | n/a |
| **Nov-75** | n/a | n/a | 426 | 73 | 0.23 | 2.5 | 0.07 | 25 | 4.4 | n/a | n/a |
| Dec-75 | n/a | n/a | 684 | 143 | 0.48 | 3.0 | 0.09 | 37 | 7.9 | n/a | n/a |
| Jan-76 | n/a | n/a | 743 | 159 | 0.54 | 3.4 | 0.10 | 41 | **9.0** | n/a | n/a |
| Feb-76 | n/a | n/a | 759 | 164 | 0.55 | 3.5 | 0.09 | 50 | **9.3** | n/a | n/a |
| Mar-76 | n/a | n/a | 508 | 95 | 0.31 | 3.5 | 0.09 | 39 | 6.1 | n/a | n/a |
| Apr-76 | n/a | n/a | 399 | 65 | 0.21 | 3.6 | 0.10 | 39 | 4.5 | n/a | n/a |
| May-76 | n/a | n/a | 408 | 68 | 0.22 | 3.4 | 0.10 | 40 | 4.6 | n/a | n/a |
| Jun-76 | n/a | n/a | 407 | 67 | 0.21 | 3.2 | 0.08 | 38 | 4.5 | n/a | n/a |
| Jul-76 | n/a | n/a | 417 | 70 | 0.23 | 3.1 | 0.08 | 37 | 4.5 | n/a | n/a |
| Aug-76 | n/a | n/a | 521 | 98 | 0.33 | 2.9 | 0.07 | 41 | 5.9 | n/a | n/a |
| Sep-76 | n/a | n/a | 534 | 102 | 0.34 | 2.6 | 0.07 | 38 | 5.9 | n/a | n/a |
| Oct-76 | n/a | n/a | 740 | 158 | 0.54 | 2.8 | 0.07 | 50 | **8.4** | n/a | n/a |
| Nov-76 | n/a | n/a | 702 | 148 | 0.50 | 3.0 | 0.07 | 44 | **8.2** | n/a | n/a |
| Dec-76 | n/a | n/a | 539 | 103 | 0.34 | 3.1 | 0.06 | 31 | 6.2 | n/a | n/a |
| Jan-77 | n/a | n/a | 735 | 157 | 0.57 | 3.4 | 0.09 | 43 | **8.9** | n/a | n/a |
| Feb-77 | n/a | n/a | 800 | 175 | 0.62 | 4.3 | 0.12 | 55 | **9.9** | n/a | n/a |
| Mar-77 | n/a | n/a | 720 | 153 | 0.74 | 4.9 | 0.16 | **79** | **9.3** | n/a | n/a |
| Apr-77 | n/a | n/a | 510 | 96 | 0.47 | 4.2 | 0.13 | 57 | 6.3 | n/a | n/a |
| May-77 | n/a | n/a | 508 | 95 | 0.35 | 3.7 | 0.11 | 54 | 6.2 | n/a | n/a |
| Jun-77 | n/a | n/a | 572 | 112 | 0.38 | 3.8 | 0.11 | 57 | 7.1 | n/a | n/a |
| Jul-77 | n/a | n/a | 533 | 102 | 0.33 | 3.8 | 0.10 | 54 | 6.5 | n/a | n/a |
| Aug-77 | n/a | n/a | 456 | 81 | 0.25 | 3.5 | 0.09 | 45 | 5.3 | n/a | n/a |
| Sep-77 | n/a | n/a | 640 | 131 | 0.45 | 3.1 | 0.08 | 52 | 7.5 | n/a | n/a |
| Oct-77 | n/a | n/a | 844 | 187 | 0.64 | 3.1 | 0.08 | 62 | **9.8** | n/a | n/a |
| Nov-77 | n/a | n/a | 774 | 168 | 0.56 | 3.0 | 0.08 | 48 | **9.0** | n/a | n/a |
| Dec-77 | n/a | n/a | 859 | 191 | 0.66 | 3.2 | 0.09 | 50 | **10.1** | n/a | n/a |
| Jan-78 | n/a | n/a | 555 | 108 | 0.36 | 6.3 | 0.23 | 47 | 7.7 | n/a | n/a |
| Feb-78 | n/a | n/a | 383 | 61 | 0.19 | 8.4 | 0.28 | 53 | 5.3 | n/a | n/a |
| Mar-78 | n/a | n/a | 365 | 56 | 0.17 | 7.8 | 0.24 | 53 | 4.8 | n/a | n/a |
| Apr-78 | n/a | n/a | 313 | 42 | 0.12 | 4.7 | 0.15 | 37 | 3.3 | n/a | n/a |
| May-78 | n/a | n/a | 230 | 19 | 0.04 | 3.7 | 0.12 | 32 | 1.4 | n/a | n/a |
| Jun-78 | n/a | n/a | 239 | 21 | 0.05 | 3.5 | 0.11 | 31 | 1.6 | n/a | n/a |
| **Jul-78** | n/a | n/a | 280 | 33 | 0.09 | 3.2 | 0.08 | 30 | 2.3 | n/a | n/a |
| Aug-78 | n/a | n/a | 316 | 42 | 0.13 | 2.8 | 0.07 | 29 | 2.9 | n/a | n/a |
| Sep-78 | n/a | n/a | 463 | 83 | 0.27 | 2.5 | 0.06 | 32 | 4.9 | n/a | n/a |
| **Oct-78** | n/a | n/a | 570 | 112 | 0.38 | 2.5 | 0.06 | 36 | 6.2 | n/a | n/a |
| Nov-78 | n/a | n/a | 562 | 110 | 0.37 | 2.6 | 0.07 | 32 | 6.2 | n/a | n/a |
| Dec-78 | n/a | n/a | 706 | 149 | 0.51 | 2.5 | 0.07 | 33 | 7.8 | n/a | n/a |
| Jan-79 | n/a | n/a | 596 | 119 | 0.40 | 3.9 | 0.12 | 38 | 7.5 | n/a | n/a |
| Feb-79 | n/a | n/a | 409 | 68 | 0.22 | 6.0 | 0.21 | 42 | 5.2 | n/a | n/a |
| Mar-79 | n/a | n/a | 309 | 41 | 0.12 | 5.7 | 0.18 | 38 | 3.3 | n/a | n/a |
| Apr-79 | n/a | n/a | 284 | 34 | 0.09 | 3.8 | 0.10 | 33 | 2.6 | n/a | n/a |
| May-79 | n/a | n/a | 278 | 32 | 0.09 | 3.3 | 0.10 | 31 | 2.4 | n/a | n/a |
| **Jun-79** | n/a | n/a | 279 | 32 | 0.09 | 3.1 | 0.09 | 30 | 2.3 | n/a | n/a |
| **Jul-79** | n/a | n/a | 285 | 34 | 0.09 | 2.7 | 0.07 | 27 | 2.3 | n/a | n/a |
| Aug-79 | n/a | n/a | 345 | 50 | 0.15 | 2.6 | 0.07 | 29 | 3.3 | n/a | n/a |
| Sep-79 | n/a | n/a | 499 | 92 | 0.31 | 2.5 | 0.06 | 35 | 5.4 | n/a | n/a |
| Oct-79 | n/a | n/a | 683 | 143 | 0.50 | 2.5 | 0.06 | 43 | 7.5 | n/a | n/a |
| Nov-79 | n/a | n/a | 581 | 115 | 0.39 | 2.4 | 0.06 | 31 | 6.3 | n/a | n/a |
| Dec-79 | n/a | n/a | 505 | 94 | 0.31 | 2.8 | 0.08 | 27 | 5.6 | n/a | n/a |
| Jan-80 | n/a | n/a | 468 | 84 | 0.27 | 5.7 | 0.21 | 38 | 6.1 | n/a | n/a |
| Feb-80 | n/a | n/a | 280 | 33 | 0.11 | 6.0 | 0.29 | 34 | 2.8 | n/a | n/a |
| Mar-80 | n/a | n/a | 205 | 12 | 0.02 | 4.7 | 0.16 | 26 | 0.7 | n/a | n/a |
| Apr-80 | n/a | n/a | 273 | 31 | 0.08 | 3.9 | 0.12 | 33 | 2.4 | n/a | n/a |
| May-80 | n/a | n/a | 266 | 29 | 0.08 | 3.2 | 0.09 | 29 | 2.1 | n/a | n/a |
| Jun-80 | n/a | n/a | 268 | 29 | 0.08 | 3.3 | 0.10 | 31 | 2.1 | n/a | n/a |
| **Jul-80** | n/a | n/a | 290 | 35 | 0.10 | 3.2 | 0.09 | 32 | 2.6 | n/a | n/a |
| Aug-80 | n/a | n/a | 302 | 39 | 0.11 | 2.9 | 0.07 | 29 | 2.7 | n/a | n/a |
| Sep-80 | n/a | n/a | 393 | 63 | 0.21 | 2.5 | 0.06 | 29 | 3.9 | n/a | n/a |
| **Oct-80** | n/a | n/a | 515 | 97 | 0.33 | 2.6 | 0.06 | 34 | 5.6 | n/a | n/a |
| Nov-80 | n/a | n/a | 511 | 96 | 0.32 | 2.6 | 0.06 | 30 | 5.6 | n/a | n/a |
| Dec-80 | n/a | n/a | 633 | 129 | 0.44 | 2.6 | 0.07 | 30 | 7.0 | n/a | n/a |
| Jan-81 | n/a | n/a | 732 | 156 | 0.54 | 3.1 | 0.09 | 38 | **8.6** | n/a | n/a |
| Feb-81 | n/a | n/a | 468 | 84 | 0.27 | 3.8 | 0.11 | 35 | 5.6 | n/a | n/a |
| Mar-81 | n/a | n/a | 312 | 41 | 0.12 | 4.2 | 0.12 | 29 | 3.1 | n/a | n/a |

Table 2B-2 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | n/a | n/a | 297 | 37 | 0.11 | 3.7 | 0.11 | 33 | 2.8 | n/a | n/a |
| ***May-81*** | n/a | n/a | 353 | 52 | 0.16 | 3.4 | 0.11 | 37 | 3.7 | n/a | n/a |
| ***Jun-81*** | n/a | n/a | 323 | 46 | 0.16 | 3.0 | 0.10 | 35 | 3.1 | n/a | n/a |
| ***Jul-81*** | n/a | n/a | 332 | 47 | 0.17 | 2.7 | 0.08 | 30 | 3.1 | n/a | n/a |
| Aug-81 | n/a | n/a | 469 | 84 | 0.21 | 2.5 | 0.07 | 31 | 5.0 | n/a | n/a |
| Sep-81 | n/a | n/a | 559 | 109 | 0.30 | 2.5 | 0.06 | 34 | 6.1 | n/a | n/a |
| Oct-81 | n/a | n/a | 743 | 159 | 0.46 | 2.5 | 0.06 | 41 | ***8.2*** | n/a | n/a |
| Nov-81 | n/a | n/a | 748 | 160 | 0.48 | 2.8 | 0.08 | 41 | ***8.5*** | n/a | n/a |
| Dec-81 | n/a | n/a | 364 | 56 | 0.14 | 4.9 | 0.18 | 30 | 4.2 | n/a | n/a |
| Jan-82 | n/a | n/a | 366 | 56 | 0.17 | 6.6 | 0.20 | 37 | 4.6 | n/a | n/a |
| Feb-82 | n/a | n/a | 321 | 44 | 0.13 | 6.1 | 0.20 | 36 | 3.6 | n/a | n/a |
| Mar-82 | n/a | n/a | 373 | 58 | 0.16 | 6.6 | 0.24 | 47 | 4.7 | n/a | n/a |
| Apr-82 | n/a | n/a | 209 | 13 | 0.02 | 4.7 | 0.18 | 30 | 0.8 | n/a | n/a |
| May-82 | n/a | n/a | 197 | 10 | 0.01 | 4.0 | 0.13 | 28 | 0.4 | n/a | n/a |
| Jun-82 | n/a | n/a | 236 | 21 | 0.05 | 3.3 | 0.10 | 29 | 1.5 | n/a | n/a |
| ***Jul-82*** | n/a | n/a | 294 | 36 | 0.10 | 3.2 | 0.09 | 32 | 2.6 | n/a | n/a |
| Aug-82 | n/a | n/a | 324 | 45 | 0.13 | 2.9 | 0.07 | 30 | 3.0 | n/a | n/a |
| Sep-82 | n/a | n/a | 394 | 64 | 0.20 | 2.4 | 0.06 | 28 | 3.9 | n/a | n/a |
| Oct-82 | n/a | n/a | 283 | 33 | 0.09 | 2.7 | 0.07 | 24 | 2.3 | n/a | n/a |
| Nov-82 | n/a | n/a | 250 | 24 | 0.06 | 3.3 | 0.11 | 24 | 1.8 | n/a | n/a |
| Dec-82 | n/a | n/a | 290 | 35 | 0.10 | 4.4 | 0.17 | 25 | 2.7 | n/a | n/a |
| Jan-83 | n/a | n/a | 227 | 18 | 0.04 | 4.1 | 0.19 | 19 | 1.3 | n/a | n/a |
| Feb-83 | n/a | n/a | 125 | 10 | 0.01 | 4.8 | 0.18 | 24 | 0.5 | n/a | n/a |
| Mar-83 | n/a | n/a | 161 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | n/a | n/a |
| Apr-83 | n/a | n/a | 222 | 17 | 0.03 | 5.6 | 0.20 | 36 | 1.3 | n/a | n/a |
| May-83 | n/a | n/a | 239 | 21 | 0.05 | 5.6 | 0.19 | 40 | 1.7 | n/a | n/a |
| Jun-83 | n/a | n/a | 154 | 10 | 0.01 | 3.8 | 0.13 | 31 | 0.5 | n/a | n/a |
| Jul-83 | n/a | n/a | 189 | 10 | 0.01 | 3.4 | 0.11 | 28 | 0.5 | n/a | n/a |
| Aug-83 | n/a | n/a | 262 | 28 | 0.07 | 2.7 | 0.07 | 25 | 1.9 | n/a | n/a |
| Sep-83 | n/a | n/a | 325 | 45 | 0.13 | 2.5 | 0.06 | 26 | 2.9 | n/a | n/a |
| Oct-83 | n/a | n/a | 255 | 26 | 0.07 | 3.0 | 0.09 | 25 | 1.8 | n/a | n/a |
| Nov-83 | n/a | n/a | 217 | 15 | 0.03 | 3.5 | 0.12 | 24 | 1.0 | n/a | n/a |
| Dec-83 | n/a | n/a | 139 | 10 | 0.01 | 3.9 | 0.14 | 22 | 0.5 | n/a | n/a |
| Jan-84 | n/a | n/a | 190 | 10 | 0.01 | 4.9 | 0.17 | 21 | 0.5 | n/a | n/a |
| Feb-84 | n/a | n/a | 262 | 28 | 0.07 | 4.3 | 0.13 | 24 | 2.1 | n/a | n/a |
| Mar-84 | n/a | n/a | 275 | 31 | 0.09 | 3.3 | 0.09 | 25 | 2.3 | n/a | n/a |
| ***Apr-84*** | n/a | n/a | 289 | 35 | 0.10 | 2.8 | 0.07 | 25 | 2.4 | n/a | n/a |
| May-84 | n/a | n/a | 329 | 46 | 0.14 | 2.9 | 0.08 | 31 | 3.1 | n/a | n/a |
| ***Jun-84*** | n/a | n/a | 320 | 43 | 0.14 | 2.9 | 0.08 | 31 | 3.0 | n/a | n/a |
| ***Jul-84*** | n/a | n/a | 282 | 33 | 0.11 | 2.7 | 0.08 | 27 | 2.3 | n/a | n/a |
| Aug-84 | n/a | n/a | 300 | 38 | 0.11 | 2.6 | 0.07 | 26 | 2.5 | n/a | n/a |
| Sep-84 | n/a | n/a | 412 | 69 | 0.23 | 2.5 | 0.06 | 30 | 4.2 | n/a | n/a |
| Oct-84 | n/a | n/a | 584 | 116 | 0.36 | 2.5 | 0.06 | 34 | 6.3 | n/a | n/a |
| Nov-84 | n/a | n/a | 689 | 144 | 0.47 | 2.8 | 0.08 | 40 | 7.9 | n/a | n/a |
| Dec-84 | n/a | n/a | 418 | 70 | 0.18 | 3.7 | 0.12 | 29 | 4.9 | n/a | n/a |
| ***Jan-85*** | n/a | n/a | 368 | 57 | 0.16 | 4.2 | 0.13 | 34 | 4.0 | n/a | n/a |
| ***Feb-85*** | n/a | n/a | 432 | 74 | 0.24 | 4.0 | 0.12 | 30 | 5.0 | n/a | n/a |
| Mar-85 | n/a | n/a | 378 | 59 | 0.18 | 4.1 | 0.11 | 32 | 4.2 | n/a | n/a |
| Apr-85 | n/a | n/a | 369 | 57 | 0.17 | 4.1 | 0.11 | 35 | 4.0 | n/a | n/a |
| May-85 | n/a | n/a | 372 | 58 | 0.18 | 3.5 | 0.10 | 38 | 4.0 | n/a | n/a |
| Jun-85 | n/a | n/a | 307 | 40 | 0.12 | 3.0 | 0.08 | 30 | 2.8 | n/a | n/a |
| ***Jul-85*** | n/a | n/a | 358 | 54 | 0.17 | 2.6 | 0.07 | 29 | 3.5 | n/a | n/a |
| Aug-85 | n/a | n/a | 521 | 98 | 0.34 | 2.4 | 0.06 | 36 | 5.6 | n/a | n/a |
| Sep-85 | n/a | n/a | 533 | 102 | 0.36 | 2.4 | 0.06 | 36 | 5.7 | n/a | n/a |
| Oct-85 | n/a | n/a | 684 | 143 | 0.49 | 2.6 | 0.06 | 43 | 7.6 | n/a | n/a |
| Nov-85 | n/a | n/a | 676 | 141 | 0.48 | 2.7 | 0.07 | 39 | 7.6 | n/a | n/a |
| Dec-85 | n/a | n/a | 599 | 120 | 0.40 | 3.5 | 0.11 | 38 | 7.3 | n/a | n/a |
| Jan-86 | n/a | n/a | 563 | 110 | 0.37 | 5.0 | 0.17 | 39 | 7.3 | n/a | n/a |
| Feb-86 | n/a | n/a | 385 | 61 | 0.19 | 8.8 | 0.33 | 55 | 5.4 | n/a | n/a |
| Mar-86 | n/a | n/a | 189 | 10 | 0.01 | 5.4 | 0.23 | 29 | 0.5 | n/a | n/a |
| Apr-86 | n/a | n/a | 235 | 20 | 0.05 | 4.5 | 0.16 | 30 | 1.5 | n/a | n/a |
| ***May-86*** | n/a | n/a | 254 | 26 | 0.06 | 3.6 | 0.12 | 32 | 1.9 | n/a | n/a |
| Jun-86 | n/a | n/a | 270 | 30 | 0.08 | 3.4 | 0.10 | 32 | 2.2 | n/a | n/a |
| ***Jul-86*** | n/a | n/a | 333 | 47 | 0.14 | 3.8 | 0.11 | 39 | 3.5 | n/a | n/a |
| Aug-86 | n/a | n/a | 360 | 54 | 0.17 | 3.4 | 0.09 | 38 | 3.8 | n/a | n/a |
| Sep-86 | n/a | n/a | 402 | 66 | 0.21 | 2.7 | 0.07 | 32 | 4.1 | n/a | n/a |

Table 2B-2 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | n/a | n/a | 557 | 108 | 0.37 | 2.4 | 0.06 | 34 | 6.0 | n/a | n/a |
| Nov-86 | n/a | n/a | 553 | 107 | 0.36 | 2.6 | 0.06 | 31 | 6.1 | n/a | n/a |
| Dec-86 | n/a | n/a | 689 | 144 | 0.50 | 2.7 | 0.07 | 34 | 7.8 | n/a | n/a |
| Jan-87 | n/a | n/a | 678 | 141 | 0.48 | 3.2 | 0.09 | 36 | ***8.0*** | n/a | n/a |
| Feb-87 | n/a | n/a | 727 | 155 | 0.53 | 4.1 | 0.12 | 47 | ***8.9*** | n/a | n/a |
| Mar-87 | n/a | n/a | 424 | 72 | 0.22 | 5.6 | 0.19 | 45 | 5.4 | n/a | n/a |
| Apr-87 | n/a | n/a | 321 | 44 | 0.13 | 5.4 | 0.17 | 42 | 3.5 | n/a | n/a |
| ***May-87*** | n/a | n/a | 374 | 58 | 0.18 | 3.9 | 0.11 | 43 | 4.2 | n/a | n/a |
| ***Jun-87*** | n/a | n/a | 322 | 44 | 0.19 | 3.0 | 0.09 | 35 | 3.1 | n/a | n/a |
| ***Jul-87*** | n/a | n/a | 315 | 42 | 0.21 | 2.7 | 0.08 | 33 | 2.8 | n/a | n/a |
| Aug-87 | n/a | n/a | 416 | 70 | 0.30 | 2.6 | 0.07 | 37 | 4.3 | n/a | n/a |
| Sep-87 | n/a | n/a | 499 | 93 | 0.34 | 2.7 | 0.06 | 39 | 5.5 | n/a | n/a |
| Oct-87 | n/a | n/a | 715 | 152 | 0.51 | 2.7 | 0.07 | 46 | ***8.1*** | n/a | n/a |
| Nov-87 | n/a | n/a | 689 | 144 | 0.46 | 2.8 | 0.07 | 39 | 7.8 | n/a | n/a |
| Dec-87 | n/a | n/a | 728 | 155 | 0.54 | 3.1 | 0.09 | 41 | ***8.6*** | n/a | n/a |
| Jan-88 | n/a | n/a | 632 | 129 | 0.44 | 5.1 | 0.18 | 44 | ***8.3*** | n/a | n/a |
| ***Feb-88*** | n/a | n/a | 388 | 62 | 0.20 | 6.0 | 0.19 | 40 | 4.9 | n/a | n/a |
| Mar-88 | n/a | n/a | 366 | 56 | 0.17 | 5.0 | 0.13 | 37 | 4.2 | n/a | n/a |
| Apr-88 | n/a | n/a | 376 | 59 | 0.18 | 4.3 | 0.11 | 37 | 4.2 | n/a | n/a |
| May-88 | n/a | n/a | 426 | 72 | 0.22 | 4.5 | 0.12 | 45 | 5.0 | n/a | n/a |
| Jun-88 | n/a | n/a | 447 | 78 | 0.24 | 4.2 | 0.11 | 44 | 5.3 | n/a | n/a |
| Jul-88 | n/a | n/a | 421 | 71 | 0.23 | 3.9 | 0.10 | 47 | 4.9 | n/a | n/a |
| Aug-88 | n/a | n/a | 499 | 92 | 0.31 | 3.8 | 0.10 | 52 | 6.1 | n/a | n/a |
| Sep-88 | n/a | n/a | 599 | 120 | 0.40 | 3.2 | 0.08 | 50 | 7.0 | n/a | n/a |
| Oct-88 | n/a | n/a | 742 | 159 | 0.55 | 3.0 | 0.08 | 53 | ***8.6*** | n/a | n/a |
| Nov-88 | n/a | n/a | 755 | 162 | 0.57 | 2.9 | 0.08 | 47 | ***8.7*** | n/a | n/a |
| Dec-88 | n/a | n/a | 733 | 157 | 0.53 | 2.8 | 0.07 | 37 | ***8.3*** | n/a | n/a |
| Jan-89 | n/a | n/a | 733 | 156 | 0.54 | 3.1 | 0.08 | 27 | ***8.6*** | n/a | n/a |
| Feb-89 | n/a | n/a | 600 | 120 | 0.41 | 4.0 | 0.11 | 46 | 7.6 | n/a | n/a |
| Mar-89 | n/a | n/a | 397 | 65 | 0.21 | 5.0 | 0.17 | 39 | 4.7 | n/a | n/a |
| Apr-89 | n/a | n/a | 261 | 27 | 0.07 | 5.6 | 0.20 | 39 | 2.3 | n/a | n/a |
| May-89 | n/a | n/a | 317 | 43 | 0.13 | 4.9 | 0.15 | 41 | 3.3 | n/a | n/a |
| ***Jun-89*** | n/a | n/a | 281 | 36 | 0.10 | 3.3 | 0.09 | 33 | 2.6 | n/a | n/a |
| ***Jul-89*** | n/a | n/a | 364 | 55 | 0.18 | 3.0 | 0.08 | 35 | 3.7 | n/a | n/a |
| Aug-89 | n/a | n/a | 392 | 63 | 0.23 | 2.7 | 0.07 | 33 | 4.0 | n/a | n/a |
| Sep-89 | n/a | n/a | 520 | 98 | 0.34 | 2.5 | 0.06 | 36 | 5.6 | n/a | n/a |
| Oct-89 | n/a | n/a | 688 | 144 | 0.49 | 2.5 | 0.06 | 43 | 7.6 | n/a | n/a |
| Nov-89 | n/a | n/a | 641 | 131 | 0.44 | 2.8 | 0.07 | 38 | 7.2 | n/a | n/a |
| Dec-89 | n/a | n/a | 627 | 127 | 0.43 | 3.0 | 0.08 | 35 | 7.3 | n/a | n/a |
| Jan-90 | n/a | n/a | 758 | 163 | 0.56 | 3.8 | 0.12 | 46 | ***9.5*** | n/a | n/a |
| Feb-90 | n/a | n/a | 633 | 129 | 0.41 | 5.1 | 0.16 | 49 | ***8.3*** | n/a | n/a |
| Mar-90 | n/a | n/a | 389 | 62 | 0.19 | 4.8 | 0.14 | 37 | 4.6 | n/a | n/a |
| Apr-90 | n/a | n/a | 410 | 68 | 0.22 | 4.9 | 0.14 | 44 | 4.9 | n/a | n/a |
| May-90 | n/a | n/a | 422 | 71 | 0.23 | 4.8 | 0.15 | 48 | 5.1 | n/a | n/a |
| Jun-90 | n/a | n/a | 430 | 74 | 0.24 | 3.9 | 0.11 | 48 | 5.1 | n/a | n/a |
| Jul-90 | n/a | n/a | 453 | 80 | 0.26 | 4.1 | 0.11 | 45 | 5.3 | n/a | n/a |
| Aug-90 | n/a | n/a | 528 | 100 | 0.33 | 4.0 | 0.11 | 49 | 6.3 | n/a | n/a |
| Sep-90 | n/a | n/a | 599 | 120 | 0.40 | 3.3 | 0.08 | 51 | 7.1 | n/a | n/a |
| Oct-90 | n/a | n/a | 832 | 183 | 0.63 | 3.0 | 0.08 | 60 | ***9.7*** | n/a | n/a |
| Nov-90 | n/a | n/a | 731 | 156 | 0.53 | 3.0 | 0.07 | 46 | ***8.5*** | n/a | n/a |
| Dec-90 | n/a | n/a | 593 | 118 | 0.40 | 3.0 | 0.08 | 33 | 6.9 | n/a | n/a |
| Jan-91 | n/a | n/a | 751 | 161 | 0.45 | 3.9 | 0.11 | 41 | ***9.4*** | n/a | n/a |
| Feb-91 | n/a | n/a | 816 | 179 | 0.47 | 4.8 | 0.13 | 50 | ***10.5*** | n/a | n/a |
| Mar-91 | n/a | n/a | 525 | 100 | 0.28 | 5.1 | 0.17 | 45 | 6.8 | n/a | n/a |
| Apr-91 | n/a | n/a | 331 | 47 | 0.14 | 5.9 | 0.19 | 46 | 3.8 | n/a | n/a |
| May-91 | n/a | n/a | 350 | 52 | 0.16 | 4.7 | 0.14 | 42 | 3.9 | n/a | n/a |
| Jun-91 | n/a | n/a | 414 | 69 | 0.22 | 4.1 | 0.11 | 42 | 4.7 | n/a | n/a |
| Jul-91 | n/a | n/a | 447 | 78 | 0.25 | 4.2 | 0.11 | 45 | 5.3 | n/a | n/a |
| Aug-91 | n/a | n/a | 526 | 100 | 0.33 | 4.1 | 0.11 | 50 | 6.4 | n/a | n/a |
| Sep-91 | n/a | n/a | 601 | 120 | 0.41 | 3.3 | 0.09 | 52 | 7.2 | n/a | n/a |

1. Project Release Months are shown in ***Bold***
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***

Table 2B-3 Monthly Average Water Quality at
Banks Pumping Plant: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | n/a | n/a | 473 | 85 | 0.28 | 2.4 | 0.07 | 30 | 5.0 | n/a | n/a |
| ***Nov-75*** | n/a | n/a | 409 | 68 | 0.22 | 2.7 | 0.06 | 26 | 4.2 | n/a | n/a |
| Dec-75 | n/a | n/a | 622 | 126 | 0.42 | 3.2 | 0.10 | 36 | 7.3 | n/a | n/a |
| Jan-76 | n/a | n/a | 666 | 138 | 0.47 | 3.6 | 0.12 | 39 | ***8.2*** | n/a | n/a |
| Feb-76 | n/a | n/a | 728 | 155 | 0.53 | 3.6 | 0.12 | 49 | ***8.9*** | n/a | n/a |
| Mar-76 | n/a | n/a | 616 | 124 | 0.42 | 3.5 | 0.12 | 45 | 7.5 | n/a | n/a |
| Apr-76 | n/a | n/a | 518 | 98 | 0.32 | 3.5 | 0.12 | 45 | 6.2 | n/a | n/a |
| May-76 | n/a | n/a | 443 | 77 | 0.25 | 3.5 | 0.12 | 43 | 5.1 | n/a | n/a |
| Jun-76 | n/a | n/a | 421 | 71 | 0.23 | 3.4 | 0.12 | 42 | 4.8 | n/a | n/a |
| Jul-76 | n/a | n/a | 406 | 67 | 0.21 | 3.3 | 0.11 | 40 | 4.5 | n/a | n/a |
| Aug-76 | n/a | n/a | 486 | 89 | 0.29 | 3.1 | 0.10 | 43 | 5.5 | n/a | n/a |
| Sep-76 | n/a | n/a | 511 | 96 | 0.32 | 2.9 | 0.09 | 40 | 5.7 | n/a | n/a |
| Oct-76 | n/a | n/a | 690 | 145 | 0.49 | 3.0 | 0.10 | 51 | ***8.1*** | n/a | n/a |
| Nov-76 | n/a | n/a | 648 | 133 | 0.45 | 3.3 | 0.11 | 45 | 7.7 | n/a | n/a |
| Dec-76 | n/a | n/a | 555 | 108 | 0.36 | 3.8 | 0.13 | 38 | 6.8 | n/a | n/a |
| Jan-77 | n/a | n/a | 679 | 142 | 0.48 | 3.9 | 0.13 | 42 | ***8.5*** | n/a | n/a |
| Feb-77 | n/a | n/a | 773 | 167 | 0.57 | 4.4 | 0.16 | 53 | ***9.7*** | n/a | n/a |
| Mar-77 | n/a | n/a | 975 | 222 | 0.77 | 3.3 | 0.11 | ***67*** | ***11.8*** | n/a | n/a |
| Apr-77 | n/a | n/a | 633 | 129 | 0.43 | 3.9 | 0.14 | 60 | ***8.0*** | n/a | n/a |
| May-77 | n/a | n/a | 538 | 103 | 0.34 | 3.8 | 0.13 | 54 | 6.7 | n/a | n/a |
| Jun-77 | n/a | n/a | 568 | 111 | 0.37 | 3.9 | 0.13 | 58 | 7.1 | n/a | n/a |
| Jul-77 | n/a | n/a | 530 | 101 | 0.33 | 4.0 | 0.14 | 49 | 6.4 | n/a | n/a |
| Aug-77 | n/a | n/a | 461 | 82 | 0.27 | 3.8 | 0.13 | 49 | 5.5 | n/a | n/a |
| Sep-77 | n/a | n/a | 589 | 117 | 0.39 | 3.4 | 0.11 | 52 | 7.1 | n/a | n/a |
| Oct-77 | n/a | n/a | 787 | 171 | 0.59 | 3.3 | 0.11 | 61 | ***9.4*** | n/a | n/a |
| Nov-77 | n/a | n/a | 743 | 159 | 0.54 | 3.2 | 0.10 | 50 | ***8.8*** | n/a | n/a |
| Dec-77 | n/a | n/a | 760 | 164 | 0.56 | 3.2 | 0.10 | 44 | ***9.0*** | n/a | n/a |
| Jan-78 | n/a | n/a | 540 | 104 | 0.34 | 6.8 | 0.26 | 49 | 7.7 | n/a | n/a |
| Feb-78 | n/a | n/a | 323 | 44 | 0.13 | 10.0 | 0.40 | 55 | 4.3 | n/a | n/a |
| Mar-78 | n/a | n/a | 340 | 49 | 0.15 | 5.7 | 0.21 | 39 | 3.9 | n/a | n/a |
| Apr-78 | n/a | n/a | 253 | 25 | 0.06 | 4.1 | 0.14 | 29 | 1.9 | n/a | n/a |
| May-78 | n/a | n/a | 230 | 19 | 0.04 | 3.9 | 0.13 | 33 | 1.4 | n/a | n/a |
| Jun-78 | n/a | n/a | 240 | 22 | 0.05 | 3.6 | 0.12 | 32 | 1.6 | n/a | n/a |
| ***Jul-78*** | n/a | n/a | 305 | 39 | 0.11 | 3.4 | 0.11 | 34 | 2.9 | n/a | n/a |
| Aug-78 | n/a | n/a | 335 | 48 | 0.14 | 3.0 | 0.09 | 32 | 3.3 | n/a | n/a |
| Sep-78 | n/a | n/a | 451 | 79 | 0.26 | 2.6 | 0.08 | 33 | 4.8 | n/a | n/a |
| ***Oct-78*** | n/a | n/a | 524 | 99 | 0.33 | 2.8 | 0.09 | 37 | 5.8 | 21.33 | 0.99 |
| Nov-78 | n/a | n/a | 507 | 95 | 0.31 | 2.8 | 0.09 | 32 | 5.7 | 20.78 | 0.97 |
| Dec-78 | n/a | n/a | 643 | 132 | 0.45 | 2.8 | 0.09 | 33 | 7.3 | 20.28 | 0.95 |
| Jan-79 | n/a | n/a | 517 | 97 | 0.32 | 4.1 | 0.14 | 31 | 6.2 | 20.13 | 0.94 |
| Feb-79 | n/a | n/a | 353 | 53 | 0.16 | 5.6 | 0.21 | 36 | 4.1 | 20.50 | 0.98 |
| Mar-79 | n/a | n/a | 313 | 42 | 0.12 | 5.9 | 0.22 | 39 | 3.4 | 20.38 | 1.03 |
| Apr-79 | n/a | n/a | 312 | 41 | 0.12 | 4.2 | 0.15 | 33 | 3.0 | 20.42 | 1.09 |
| May-79 | n/a | n/a | 289 | 35 | 0.10 | 3.4 | 0.11 | 33 | 2.6 | 20.52 | 1.11 |
| ***Jun-79*** | n/a | n/a | 304 | 39 | 0.11 | 3.3 | 0.11 | 33 | 2.8 | 20.59 | 1.13 |
| ***Jul-79*** | n/a | n/a | 301 | 38 | 0.11 | 2.9 | 0.09 | 29 | 2.7 | 20.53 | 1.13 |
| Aug-79 | n/a | n/a | 352 | 52 | 0.16 | 2.8 | 0.09 | 31 | 3.5 | 20.63 | 1.15 |
| Sep-79 | n/a | n/a | 475 | 86 | 0.28 | 2.7 | 0.08 | 36 | 5.2 | 20.73 | 1.16 |
| Oct-79 | n/a | n/a | 636 | 130 | 0.44 | 2.8 | 0.09 | 43 | 7.2 | 21.15 | 1.17 |
| Nov-79 | n/a | n/a | 553 | 107 | 0.36 | 2.6 | 0.08 | 31 | 6.1 | 21.44 | 1.18 |
| Dec-79 | n/a | n/a | 494 | 91 | 0.30 | 2.9 | 0.09 | 28 | 5.5 | 21.77 | 1.19 |
| Jan-80 | n/a | n/a | 315 | 42 | 0.12 | 6.4 | 0.24 | 32 | 3.5 | 22.63 | 1.21 |
| Feb-80 | n/a | n/a | 162 | 10 | 0.01 | 4.2 | 0.15 | 21 | 0.5 | 22.88 | 1.33 |
| Mar-80 | n/a | n/a | 227 | 18 | 0.04 | 4.4 | 0.16 | 26 | 1.3 | 22.69 | 1.37 |
| Apr-80 | n/a | n/a | 263 | 33 | 0.09 | 3.6 | 0.12 | 32 | 2.5 | 22.34 | 1.41 |
| May-80 | n/a | n/a | 274 | 31 | 0.08 | 3.3 | 0.11 | 31 | 2.3 | 22.38 | 1.44 |
| Jun-80 | n/a | n/a | 278 | 32 | 0.09 | 3.4 | 0.11 | 33 | 2.4 | 22.60 | 1.47 |
| ***Jul-80*** | n/a | n/a | 316 | 40 | 0.12 | 3.5 | 0.12 | 36 | 3.1 | 22.70 | 1.49 |
| Aug-80 | n/a | n/a | 332 | 47 | 0.14 | 3.1 | 0.10 | 33 | 3.3 | 22.77 | 1.50 |
| Sep-80 | n/a | n/a | 400 | 65 | 0.21 | 2.7 | 0.08 | 32 | 4.1 | 22.87 | 1.51 |
| ***Oct-80*** | n/a | n/a | 481 | 88 | 0.29 | 2.8 | 0.09 | 35 | 5.3 | 23.25 | 1.53 |
| Nov-80 | n/a | n/a | 479 | 87 | 0.28 | 2.8 | 0.09 | 30 | 5.3 | 23.82 | 1.55 |
| Dec-80 | n/a | n/a | 589 | 117 | 0.39 | 2.8 | 0.09 | 31 | 6.7 | 24.00 | 1.57 |
| Jan-81 | n/a | n/a | 634 | 129 | 0.44 | 3.3 | 0.11 | 35 | 7.6 | 23.89 | 1.57 |
| Feb-81 | n/a | n/a | 538 | 103 | 0.34 | 3.7 | 0.13 | 39 | 6.6 | 24.27 | 1.49 |
| Mar-81 | n/a | n/a | 477 | 87 | 0.28 | 4.1 | 0.14 | 37 | 5.7 | 24.81 | 1.40 |

2B-7

Table 2B-3 Monthly Average Water Quality at
Banks Pumping Plant: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | n/a | n/a | 361 | 55 | 0.17 | 3.9 | 0.13 | 39 | 4.0 | 25.18 | 1.38 |
| ***May-81*** | n/a | n/a | 376 | 59 | 0.18 | 3.5 | 0.12 | 39 | 4.1 | 25.04 | 1.34 |
| ***Jun-81*** | n/a | n/a | 347 | 51 | 0.15 | 3.2 | 0.11 | 35 | 3.5 | 25.12 | 1.31 |
| ***Jul-81*** | n/a | n/a | 331 | 47 | 0.14 | 2.9 | 0.09 | 31 | 3.2 | 25.17 | 1.29 |
| Aug-81 | n/a | n/a | 439 | 76 | 0.24 | 2.7 | 0.08 | 35 | 4.7 | 25.52 | 1.31 |
| Sep-81 | n/a | n/a | 521 | 98 | 0.32 | 2.7 | 0.08 | 38 | 5.7 | 26.00 | 1.32 |
| Oct-81 | n/a | n/a | 694 | 146 | 0.49 | 2.8 | 0.09 | 46 | 7.9 | 25.45 | 1.29 |
| Nov-81 | n/a | n/a | 693 | 146 | 0.49 | 3.0 | 0.09 | 43 | ***8.0*** | 25.28 | 1.28 |
| Dec-81 | n/a | n/a | 408 | 68 | 0.21 | 4.6 | 0.17 | 32 | 4.8 | 26.56 | 1.30 |
| Jan-82 | n/a | n/a | 365 | 56 | 0.17 | 8.0 | 0.31 | 43 | 4.9 | 26.44 | 1.36 |
| Feb-82 | n/a | n/a | 262 | 28 | 0.07 | 5.7 | 0.22 | 31 | 2.3 | 25.76 | 1.43 |
| Mar-82 | n/a | n/a | 244 | 23 | 0.05 | 3.6 | 0.12 | 26 | 1.7 | 25.45 | 1.44 |
| Apr-82 | n/a | n/a | 154 | 10 | 0.01 | 4.1 | 0.14 | 26 | 0.5 | 25.26 | 1.42 |
| May-82 | n/a | n/a | 176 | 10 | 0.01 | 3.9 | 0.14 | 31 | 0.5 | 25.10 | 1.45 |
| Jun-82 | n/a | n/a | 244 | 23 | 0.05 | 3.5 | 0.12 | 31 | 1.7 | 24.97 | 1.48 |
| ***Jul-82*** | n/a | n/a | 320 | 44 | 0.13 | 3.5 | 0.12 | 36 | 3.2 | 25.06 | 1.51 |
| Aug-82 | n/a | n/a | 357 | 54 | 0.16 | 3.1 | 0.10 | 34 | 3.7 | 24.84 | 1.49 |
| Sep-82 | n/a | n/a | 403 | 66 | 0.21 | 2.6 | 0.08 | 30 | 4.1 | 24.87 | 1.49 |
| Oct-82 | n/a | n/a | 280 | 33 | 0.09 | 2.9 | 0.09 | 26 | 2.3 | 25.52 | 1.52 |
| Nov-82 | n/a | n/a | 256 | 26 | 0.07 | 3.4 | 0.11 | 25 | 1.9 | 25.19 | 1.56 |
| Dec-82 | n/a | n/a | 143 | 10 | 0.01 | 3.6 | 0.12 | 21 | 0.5 | 24.65 | 1.60 |
| Jan-83 | n/a | n/a | 148 | 10 | 0.01 | 3.9 | 0.13 | 20 | 0.5 | 23.38 | 1.60 |
| Feb-83 | n/a | n/a | 116 | 10 | 0.01 | 4.8 | 0.17 | 24 | 0.5 | 22.59 | 1.50 |
| Mar-83 | n/a | n/a | 156 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | 22.58 | 1.51 |
| Apr-83 | n/a | n/a | 187 | 10 | 0.01 | 5.2 | 0.19 | 32 | 0.5 | 22.48 | 1.51 |
| May-83 | n/a | n/a | 160 | 10 | 0.01 | 4.8 | 0.18 | 33 | 0.5 | 22.25 | 1.53 |
| Jun-83 | n/a | n/a | 152 | 10 | 0.01 | 3.9 | 0.13 | 31 | 0.5 | 22.03 | 1.54 |
| Jul-83 | n/a | n/a | 189 | 10 | 0.01 | 3.5 | 0.12 | 29 | 0.5 | 21.82 | 1.56 |
| Aug-83 | n/a | n/a | 275 | 31 | 0.08 | 2.9 | 0.09 | 27 | 2.2 | 21.83 | 1.59 |
| Sep-83 | n/a | n/a | 350 | 52 | 0.16 | 2.8 | 0.09 | 30 | 3.4 | 22.10 | 1.63 |
| Oct-83 | n/a | n/a | 267 | 29 | 0.08 | 3.2 | 0.10 | 27 | 2.1 | 21.97 | 1.63 |
| Nov-83 | n/a | n/a | 199 | 11 | 0.01 | 3.4 | 0.11 | 22 | 0.5 | 21.29 | 1.63 |
| Dec-83 | n/a | n/a | 125 | 10 | 0.01 | 3.8 | 0.13 | 22 | 0.5 | 20.62 | 1.64 |
| Jan-84 | n/a | n/a | 173 | 10 | 0.01 | 4.4 | 0.16 | 19 | 0.5 | 19.79 | 1.65 |
| Feb-84 | n/a | n/a | 267 | 29 | 0.08 | 3.7 | 0.13 | 25 | 2.2 | 17.36 | 1.64 |
| Mar-84 | n/a | n/a | 332 | 47 | 0.14 | 3.3 | 0.11 | 27 | 3.3 | 16.64 | 1.65 |
| ***Apr-84*** | n/a | n/a | 347 | 51 | 0.15 | 3.0 | 0.09 | 29 | 3.4 | 16.33 | 1.65 |
| May-84 | n/a | n/a | 349 | 51 | 0.16 | 3.0 | 0.10 | 32 | 3.5 | 16.45 | 1.65 |
| ***Jun-84*** | n/a | n/a | 357 | 54 | 0.16 | 3.1 | 0.10 | 34 | 3.7 | 16.43 | 1.65 |
| ***Jul-84*** | n/a | n/a | 308 | 40 | 0.12 | 2.9 | 0.09 | 30 | 2.8 | 16.49 | 1.65 |
| Aug-84 | n/a | n/a | 321 | 44 | 0.13 | 2.8 | 0.08 | 29 | 3.0 | 16.28 | 1.64 |
| Sep-84 | n/a | n/a | 416 | 70 | 0.22 | 2.6 | 0.08 | 32 | 4.3 | 16.08 | 1.65 |
| Oct-84 | n/a | n/a | 562 | 110 | 0.37 | 2.7 | 0.08 | 37 | 6.2 | 16.11 | 1.66 |
| Nov-84 | n/a | n/a | 627 | 128 | 0.43 | 3.0 | 0.09 | 40 | 7.2 | 16.16 | 1.66 |
| Dec-84 | n/a | n/a | 442 | 77 | 0.25 | 3.9 | 0.13 | 33 | 5.3 | 16.47 | 1.66 |
| ***Jan-85*** | n/a | n/a | 422 | 71 | 0.23 | 4.3 | 0.15 | 27 | 4.9 | 16.51 | 1.65 |
| ***Feb-85*** | n/a | n/a | 503 | 94 | 0.31 | 4.1 | 0.14 | 35 | 6.0 | 16.20 | 1.55 |
| Mar-85 | n/a | n/a | 498 | 92 | 0.30 | 4.1 | 0.14 | 38 | 6.0 | 16.43 | 1.50 |
| Apr-85 | n/a | n/a | 476 | 86 | 0.28 | 4.1 | 0.14 | 43 | 5.6 | 16.40 | 1.46 |
| May-85 | n/a | n/a | 406 | 67 | 0.21 | 3.6 | 0.12 | 41 | 4.6 | 16.48 | 1.42 |
| Jun-85 | n/a | n/a | 334 | 47 | 0.14 | 3.2 | 0.10 | 34 | 3.3 | 16.55 | 1.37 |
| ***Jul-85*** | n/a | n/a | 345 | 50 | 0.15 | 2.7 | 0.08 | 30 | 3.3 | 16.61 | 1.35 |
| Aug-85 | n/a | n/a | 478 | 87 | 0.28 | 2.6 | 0.08 | 35 | 5.1 | 17.30 | 1.38 |
| Sep-85 | n/a | n/a | 502 | 93 | 0.31 | 2.6 | 0.08 | 35 | 5.4 | 18.21 | 1.39 |
| Oct-85 | n/a | n/a | 658 | 136 | 0.46 | 2.8 | 0.09 | 45 | 7.5 | 17.59 | 1.36 |
| Nov-85 | n/a | n/a | 649 | 133 | 0.45 | 3.0 | 0.10 | 41 | 7.5 | 17.91 | 1.32 |
| Dec-85 | n/a | n/a | 604 | 121 | 0.41 | 4.0 | 0.14 | 43 | 7.6 | 18.35 | 1.28 |
| Jan-86 | n/a | n/a | 549 | 106 | 0.35 | 5.2 | 0.19 | 40 | 7.3 | 19.63 | 1.28 |
| Feb-86 | n/a | n/a | 345 | 50 | 0.15 | 9.8 | 0.39 | 56 | 4.7 | 21.47 | 1.34 |
| Mar-86 | n/a | n/a | 163 | 10 | 0.01 | 4.6 | 0.16 | 25 | 0.5 | 22.17 | 1.45 |
| Apr-86 | n/a | n/a | 232 | 19 | 0.04 | 4.2 | 0.15 | 29 | 1.4 | 22.20 | 1.45 |
| ***May-86*** | n/a | n/a | 260 | 27 | 0.07 | 3.6 | 0.12 | 33 | 2.0 | 22.29 | 1.44 |
| Jun-86 | n/a | n/a | 276 | 31 | 0.08 | 3.5 | 0.12 | 33 | 2.3 | 22.47 | 1.43 |
| ***Jul-86*** | n/a | n/a | 350 | 52 | 0.16 | 3.9 | 0.13 | 42 | 3.8 | 22.62 | 1.42 |
| Aug-86 | n/a | n/a | 411 | 68 | 0.22 | 3.7 | 0.13 | 44 | 4.7 | 22.64 | 1.38 |
| Sep-86 | n/a | n/a | 426 | 72 | 0.23 | 2.9 | 0.09 | 35 | 4.6 | 22.15 | 1.33 |

Table 2B-3 Monthly Average Water Quality at
Banks Pumping Plant: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | n/a | n/a | 530 | 101 | 0.33 | 2.6 | 0.08 | 35 | 5.8 | 22.55 | 1.34 |
| Nov-86 | n/a | n/a | 529 | 101 | 0.33 | 2.8 | 0.09 | 32 | 5.9 | 23.25 | 1.33 |
| Dec-86 | n/a | n/a | 627 | 127 | 0.43 | 3.0 | 0.10 | 35 | 7.3 | 23.51 | 1.31 |
| Jan-87 | n/a | n/a | 634 | 129 | 0.44 | 3.3 | 0.11 | 34 | 7.6 | 24.13 | 1.29 |
| Feb-87 | n/a | n/a | 707 | 149 | 0.51 | 3.7 | 0.13 | 49 | ***8.8*** | 25.90 | 1.29 |
| Mar-87 | n/a | n/a | 573 | 113 | 0.38 | 5.0 | 0.18 | 51 | 7.4 | 27.41 | 1.28 |
| Apr-87 | n/a | n/a | 418 | 70 | 0.22 | 5.3 | 0.20 | 49 | 5.2 | 27.89 | 1.29 |
| ***May-87*** | n/a | n/a | 415 | 70 | 0.22 | 4.1 | 0.14 | 41 | 4.7 | 27.73 | 1.28 |
| ***Jun-87*** | n/a | n/a | 354 | 53 | 0.16 | 3.3 | 0.11 | 36 | 3.7 | 27.60 | 1.28 |
| ***Jul-87*** | n/a | n/a | 319 | 43 | 0.13 | 2.9 | 0.09 | 30 | 3.0 | 27.48 | 1.27 |
| Aug-87 | n/a | n/a | 400 | 65 | 0.21 | 2.8 | 0.09 | 34 | 4.2 | 27.52 | 1.27 |
| Sep-87 | n/a | n/a | 480 | 87 | 0.28 | 2.9 | 0.09 | 38 | 5.3 | 27.33 | 1.25 |
| Oct-87 | n/a | n/a | 683 | 143 | 0.48 | 2.9 | 0.09 | 48 | 7.9 | 26.95 | 1.24 |
| Nov-87 | n/a | n/a | 656 | 135 | 0.46 | 3.0 | 0.10 | 42 | 7.6 | 26.67 | 1.23 |
| Dec-87 | n/a | n/a | 668 | 139 | 0.47 | 3.3 | 0.11 | 40 | ***8.6*** | 25.08 | 1.19 |
| Jan-88 | n/a | n/a | 621 | 126 | 0.42 | 5.1 | 0.19 | 44 | ***8.2*** | 25.50 | 1.16 |
| ***Feb-88*** | n/a | n/a | 501 | 93 | 0.31 | 6.0 | 0.23 | 48 | 6.7 | 27.22 | 1.22 |
| Mar-88 | n/a | n/a | 533 | 102 | 0.34 | 6.0 | 0.23 | 56 | 7.2 | 26.84 | 1.21 |
| Apr-88 | n/a | n/a | 510 | 95 | 0.31 | 5.1 | 0.19 | 54 | 6.5 | 26.67 | 1.20 |
| May-88 | n/a | n/a | 462 | 82 | 0.27 | 4.8 | 0.17 | 51 | 5.7 | 26.60 | 1.20 |
| Jun-88 | n/a | n/a | 473 | 85 | 0.28 | 4.5 | 0.16 | 50 | 5.8 | 26.52 | 1.19 |
| Jul-88 | n/a | n/a | 436 | 75 | 0.24 | 4.1 | 0.14 | 43 | 5.0 | 26.23 | 1.17 |
| Aug-88 | n/a | n/a | 490 | 90 | 0.29 | 4.0 | 0.14 | 46 | 5.8 | 25.42 | 1.13 |
| Sep-88 | n/a | n/a | 569 | 111 | 0.37 | 3.4 | 0.12 | 52 | 6.8 | 24.14 | 1.09 |
| Oct-88 | n/a | n/a | 713 | 151 | 0.51 | 3.2 | 0.10 | 54 | ***8.4*** | 23.62 | 1.08 |
| Nov-88 | n/a | n/a | 713 | 151 | 0.51 | 3.1 | 0.10 | 46 | ***8.4*** | 23.13 | 1.07 |
| Dec-88 | n/a | n/a | 674 | 140 | 0.47 | 3.2 | 0.10 | 39 | 8.0 | 22.78 | 1.06 |
| Jan-89 | n/a | n/a | 685 | 143 | 0.49 | 3.4 | 0.11 | 38 | ***8.2*** | 22.14 | 1.03 |
| Feb-89 | n/a | n/a | 688 | 144 | 0.49 | 3.9 | 0.14 | 50 | ***8.7*** | 20.95 | 0.95 |
| Mar-89 | n/a | n/a | 458 | 81 | 0.26 | 5.5 | 0.20 | 46 | 5.9 | 20.61 | 0.81 |
| Apr-89 | n/a | n/a | 296 | 37 | 0.10 | 5.7 | 0.21 | 42 | 3.0 | 21.83 | 0.84 |
| May-89 | n/a | n/a | 352 | 52 | 0.16 | 5.2 | 0.19 | 46 | 4.0 | 21.97 | 0.85 |
| ***Jun-89*** | n/a | n/a | 315 | 42 | 0.12 | 3.6 | 0.12 | 37 | 3.1 | 22.06 | 0.85 |
| ***Jul-89*** | n/a | n/a | 361 | 55 | 0.17 | 3.3 | 0.11 | 37 | 3.8 | 21.97 | 0.84 |
| Aug-89 | n/a | n/a | 376 | 59 | 0.18 | 2.9 | 0.09 | 33 | 3.9 | 22.14 | 0.84 |
| Sep-89 | n/a | n/a | 488 | 89 | 0.29 | 2.7 | 0.08 | 36 | 5.3 | 22.49 | 0.86 |
| Oct-89 | n/a | n/a | 654 | 135 | 0.46 | 2.7 | 0.08 | 43 | 7.4 | 22.03 | 0.84 |
| Nov-89 | n/a | n/a | 626 | 127 | 0.43 | 2.9 | 0.09 | 39 | 7.2 | 21.72 | 0.83 |
| Dec-89 | n/a | n/a | 621 | 126 | 0.42 | 3.4 | 0.11 | 38 | 7.5 | 21.97 | 0.83 |
| Jan-90 | n/a | n/a | 687 | 144 | 0.49 | 3.9 | 0.13 | 43 | 8.6 | 21.89 | 0.83 |
| Feb-90 | n/a | n/a | 668 | 139 | 0.47 | 5.4 | 0.20 | 56 | 8.9 | 21.88 | 0.83 |
| Mar-90 | n/a | n/a | 550 | 106 | 0.35 | 5.7 | 0.21 | 55 | 7.4 | 20.47 | 0.80 |
| Apr-90 | n/a | n/a | 598 | 120 | 0.40 | 5.4 | 0.20 | ***64*** | 8.0 | 19.88 | 0.78 |
| May-90 | n/a | n/a | 457 | 81 | 0.26 | 5.1 | 0.19 | 53 | 5.7 | 19.76 | 0.77 |
| Jun-90 | n/a | n/a | 444 | 77 | 0.25 | 4.1 | 0.15 | 44 | 5.2 | 19.89 | 0.78 |
| Jul-90 | n/a | n/a | 461 | 82 | 0.27 | 4.3 | 0.15 | 47 | 5.5 | 19.80 | 0.77 |
| Aug-90 | n/a | n/a | 517 | 97 | 0.32 | 4.3 | 0.15 | 51 | 6.3 | 19.39 | 0.75 |
| Sep-90 | n/a | n/a | 563 | 110 | 0.37 | 3.6 | 0.12 | 53 | 6.8 | 19.02 | 0.73 |
| Oct-90 | n/a | n/a | 767 | 166 | 0.57 | 3.2 | 0.11 | 59 | ***9.1*** | 19.05 | 0.73 |
| Nov-90 | n/a | n/a | 715 | 151 | 0.51 | 3.2 | 0.10 | 47 | ***8.5*** | 18.67 | 0.72 |
| Dec-90 | n/a | n/a | 608 | 122 | 0.41 | 3.1 | 0.10 | 35 | 7.1 | 18.38 | 0.72 |
| Jan-91 | n/a | n/a | 695 | 146 | 0.50 | 3.6 | 0.12 | 41 | ***8.5*** | 16.77 | 0.68 |
| Feb-91 | n/a | n/a | 797 | 174 | 0.60 | 4.2 | 0.15 | 53 | ***9.8*** | 14.79 | 0.59 |
| Mar-91 | n/a | n/a | 572 | 112 | 0.38 | 5.5 | 0.21 | 55 | 7.6 | 14.68 | 0.58 |
| Apr-91 | n/a | n/a | 397 | 64 | 0.20 | 6.1 | 0.23 | 52 | 5.0 | 16.06 | 0.65 |
| May-91 | n/a | n/a | 380 | 60 | 0.19 | 5.0 | 0.18 | 46 | 4.5 | 16.19 | 0.66 |
| Jun-91 | n/a | n/a | 421 | 71 | 0.23 | 4.2 | 0.15 | 43 | 4.9 | 16.26 | 0.67 |
| Jul-91 | n/a | n/a | 458 | 81 | 0.26 | 4.3 | 0.15 | 47 | 5.5 | 16.17 | 0.67 |
| Aug-91 | n/a | n/a | 515 | 97 | 0.32 | 4.3 | 0.15 | 52 | 6.3 | 16.15 | 0.67 |
| Sep-91 | n/a | n/a | 555 | 108 | 0.36 | 3.6 | 0.12 | 53 | 6.8 | 16.08 | 0.66 |

1. Project Release Months are shown in ***Bold***
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***

Table 2B-4 Monthly Average Water Quality at
Tracy Pumping Plant: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | n/a | n/a | 483 | 88 | 0.29 | 2.5 | 0.07 | 31 | 5.1 | n/a | n/a |
| ***Nov-75*** | n/a | n/a | 409 | 68 | 0.22 | 2.6 | 0.08 | 25 | 4.2 | n/a | n/a |
| Dec-75 | n/a | n/a | 622 | 126 | 0.42 | 3.2 | 0.10 | 37 | 7.4 | n/a | n/a |
| Jan-76 | n/a | n/a | 659 | 136 | 0.46 | 3.5 | 0.12 | 38 | ***8.0*** | n/a | n/a |
| Feb-76 | n/a | n/a | 739 | 158 | 0.54 | 3.5 | 0.12 | 48 | ***9.0*** | n/a | n/a |
| Mar-76 | n/a | n/a | 637 | 130 | 0.44 | 3.4 | 0.11 | 46 | 7.7 | n/a | n/a |
| Apr-76 | n/a | n/a | 538 | 103 | 0.34 | 3.4 | 0.12 | 46 | 6.4 | n/a | n/a |
| May-76 | n/a | n/a | 447 | 78 | 0.25 | 3.5 | 0.12 | 43 | 5.2 | n/a | n/a |
| Jun-76 | n/a | n/a | 421 | 71 | 0.23 | 3.4 | 0.11 | 42 | 4.8 | n/a | n/a |
| Jul-76 | n/a | n/a | 406 | 67 | 0.21 | 3.3 | 0.11 | 39 | 4.5 | n/a | n/a |
| Aug-76 | n/a | n/a | 489 | 90 | 0.29 | 3.1 | 0.10 | 43 | 5.6 | n/a | n/a |
| Sep-76 | n/a | n/a | 511 | 96 | 0.32 | 2.8 | 0.09 | 40 | 5.7 | n/a | n/a |
| Oct-76 | n/a | n/a | 689 | 144 | 0.49 | 3.0 | 0.10 | 50 | ***8.0*** | n/a | n/a |
| Nov-76 | n/a | n/a | 651 | 134 | 0.45 | 3.3 | 0.11 | 45 | 7.8 | n/a | n/a |
| Dec-76 | n/a | n/a | 560 | 109 | 0.36 | 3.8 | 0.13 | 39 | 6.9 | n/a | n/a |
| Jan-77 | n/a | n/a | 685 | 143 | 0.49 | 3.9 | 0.14 | 43 | ***8.7*** | n/a | n/a |
| Feb-77 | n/a | n/a | 784 | 170 | 0.58 | 4.3 | 0.15 | 53 | ***9.8*** | n/a | n/a |
| Mar-77 | n/a | n/a | 1062 | ***246*** | 0.85 | 3.8 | 0.13 | ***84*** | ***12.0*** | n/a | n/a |
| Apr-77 | n/a | n/a | 651 | 134 | 0.45 | 3.9 | 0.13 | 60 | ***8.2*** | n/a | n/a |
| May-77 | n/a | n/a | 540 | 104 | 0.34 | 3.8 | 0.13 | 55 | 6.7 | n/a | n/a |
| Jun-77 | n/a | n/a | 568 | 111 | 0.37 | 3.9 | 0.13 | 58 | 7.1 | n/a | n/a |
| Jul-77 | n/a | n/a | 533 | 102 | 0.34 | 4.0 | 0.14 | 50 | 6.4 | n/a | n/a |
| Aug-77 | n/a | n/a | 462 | 82 | 0.27 | 3.8 | 0.13 | 49 | 5.5 | n/a | n/a |
| Sep-77 | n/a | n/a | 589 | 117 | 0.39 | 3.4 | 0.11 | 52 | 7.1 | n/a | n/a |
| Oct-77 | n/a | n/a | 783 | 170 | 0.58 | 3.3 | 0.11 | 61 | ***9.3*** | n/a | n/a |
| Nov-77 | n/a | n/a | 744 | 159 | 0.54 | 3.2 | 0.10 | 50 | ***8.8*** | n/a | n/a |
| Dec-77 | n/a | n/a | 750 | 161 | 0.55 | 3.1 | 0.10 | 42 | ***8.8*** | n/a | n/a |
| Jan-78 | n/a | n/a | 531 | 101 | 0.33 | 7.1 | 0.27 | 50 | 7.6 | n/a | n/a |
| Feb-78 | n/a | n/a | 316 | 42 | 0.12 | 10.4 | 0.42 | 56 | 4.1 | n/a | n/a |
| Mar-78 | n/a | n/a | 342 | 49 | 0.15 | 4.8 | 0.17 | 34 | 3.7 | n/a | n/a |
| Apr-78 | n/a | n/a | 343 | 22 | 0.05 | 4.0 | 0.14 | 32 | 1.7 | n/a | n/a |
| May-78 | n/a | n/a | 231 | 19 | 0.04 | 3.9 | 0.13 | 33 | 1.4 | n/a | n/a |
| Jun-78 | n/a | n/a | 240 | 22 | 0.05 | 3.6 | 0.12 | 32 | 1.6 | n/a | n/a |
| ***Jul-78*** | n/a | n/a | 305 | 39 | 0.11 | 3.4 | 0.11 | 34 | 2.9 | n/a | n/a |
| Aug-78 | n/a | n/a | 335 | 48 | 0.14 | 3.0 | 0.09 | 32 | 3.2 | n/a | n/a |
| Sep-78 | n/a | n/a | 450 | 79 | 0.26 | 2.6 | 0.08 | 33 | 4.8 | n/a | n/a |
| ***Oct-78*** | n/a | n/a | 531 | 101 | 0.33 | 2.8 | 0.09 | 37 | 5.9 | 21.22 | 0.85 |
| Nov-78 | n/a | n/a | 506 | 94 | 0.31 | 2.8 | 0.09 | 32 | 5.7 | 21.34 | 0.85 |
| Dec-78 | n/a | n/a | 643 | 132 | 0.44 | 2.9 | 0.09 | 34 | 7.4 | 21.39 | 0.85 |
| Jan-79 | n/a | n/a | 470 | 85 | 0.28 | 4.1 | 0.14 | 28 | 5.5 | 20.87 | 0.83 |
| Feb-79 | n/a | n/a | 329 | 46 | 0.14 | 5.3 | 0.19 | 32 | 3.6 | 20.43 | 0.84 |
| Mar-79 | n/a | n/a | 312 | 42 | 0.12 | 5.8 | 0.22 | 38 | 3.4 | 19.46 | 0.85 |
| Apr-79 | n/a | n/a | 321 | 44 | 0.13 | 3.9 | 0.14 | 37 | 3.3 | 19.06 | 0.88 |
| May-79 | n/a | n/a | 293 | 36 | 0.10 | 3.4 | 0.11 | 33 | 2.6 | 19.07 | 0.91 |
| ***Jun-79*** | n/a | n/a | 304 | 39 | 0.11 | 3.3 | 0.11 | 33 | 2.8 | 19.03 | 0.92 |
| ***Jul-79*** | n/a | n/a | 300 | 38 | 0.11 | 2.9 | 0.09 | 29 | 2.7 | 18.89 | 0.93 |
| Aug-79 | n/a | n/a | 352 | 52 | 0.16 | 2.8 | 0.09 | 31 | 3.5 | 18.73 | 0.93 |
| Sep-79 | n/a | n/a | 474 | 86 | 0.28 | 2.7 | 0.08 | 36 | 5.2 | 18.62 | 0.93 |
| Oct-79 | n/a | n/a | 641 | 131 | 0.44 | 2.8 | 0.09 | 43 | 7.3 | 18.63 | 0.94 |
| Nov-79 | n/a | n/a | 554 | 108 | 0.36 | 2.6 | 0.08 | 31 | 6.1 | 18.66 | 0.94 |
| Dec-79 | n/a | n/a | 517 | 97 | 0.32 | 2.9 | 0.09 | 29 | 5.8 | 19.13 | 0.95 |
| Jan-80 | n/a | n/a | 287 | 35 | 0.10 | 6.8 | 0.26 | 33 | 3.0 | 19.51 | 0.96 |
| Feb-80 | n/a | n/a | 178 | 10 | 0.01 | 4.1 | 0.14 | 21 | 0.5 | 18.73 | 0.99 |
| Mar-80 | n/a | n/a | 233 | 20 | 0.04 | 4.3 | 0.15 | 26 | 1.5 | 17.47 | 0.99 |
| Apr-80 | n/a | n/a | 286 | 34 | 0.09 | 3.5 | 0.12 | 31 | 2.5 | 17.62 | 1.02 |
| May-80 | n/a | n/a | 279 | 32 | 0.09 | 3.3 | 0.11 | 31 | 2.4 | 17.43 | 1.03 |
| Jun-80 | n/a | n/a | 278 | 32 | 0.09 | 3.4 | 0.11 | 33 | 2.4 | 17.46 | 1.04 |
| ***Jul-80*** | n/a | n/a | 315 | 40 | 0.12 | 3.5 | 0.12 | 35 | 3.1 | 17.52 | 1.06 |
| Aug-80 | n/a | n/a | 331 | 47 | 0.14 | 3.1 | 0.10 | 33 | 3.2 | 17.68 | 1.08 |
| Sep-80 | n/a | n/a | 398 | 65 | 0.20 | 2.7 | 0.08 | 32 | 4.1 | 17.89 | 1.10 |
| ***Oct-80*** | n/a | n/a | 469 | 90 | 0.29 | 2.8 | 0.09 | 35 | 5.4 | 17.96 | 1.11 |
| Nov-80 | n/a | n/a | 477 | 87 | 0.28 | 2.8 | 0.09 | 30 | 5.3 | 18.15 | 1.13 |
| Dec-80 | n/a | n/a | 593 | 118 | 0.40 | 2.8 | 0.09 | 31 | 6.8 | 18.04 | 1.13 |
| Jan-81 | n/a | n/a | 613 | 124 | 0.42 | 3.3 | 0.11 | 34 | 7.3 | 17.67 | 1.13 |
| Feb-81 | n/a | n/a | 541 | 104 | 0.34 | 3.7 | 0.12 | 38 | 6.6 | 17.70 | 1.09 |
| Mar-81 | n/a | n/a | 513 | 96 | 0.22 | 4.0 | 0.14 | 38 | 6.1 | 17.89 | 1.02 |

Table 2B-4 Monthly Average Water Quality at
Tracy Pumping Plant: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | n/a | n/a | 413 | 69 | 0.22 | 3.7 | 0.13 | 41 | 4.8 | 18.09 | 1.01 |
| ***May-81*** | n/a | n/a | 383 | 61 | 0.19 | 3.5 | 0.12 | 39 | 4.2 | 18.49 | 1.02 |
| ***Jun-81*** | n/a | n/a | 347 | 51 | 0.15 | 3.2 | 0.11 | 35 | 3.5 | 18.61 | 1.00 |
| ***Jul-81*** | n/a | n/a | 331 | 47 | 0.14 | 2.9 | 0.09 | 31 | 3.2 | 18.88 | 1.00 |
| Aug-81 | n/a | n/a | 440 | 76 | 0.25 | 2.7 | 0.08 | 35 | 4.7 | 18.99 | 1.00 |
| Sep-81 | n/a | n/a | 520 | 98 | 0.32 | 2.7 | 0.08 | 38 | 5.7 | 19.26 | 0.99 |
| Oct-81 | n/a | n/a | 696 | 146 | 0.50 | 2.8 | 0.09 | 47 | 7.9 | 19.43 | 0.99 |
| Nov-81 | n/a | n/a | 697 | 146 | 0.50 | 3.0 | 0.09 | 43 | **8.1** | 19.51 | 0.99 |
| Dec-81 | n/a | n/a | 488 | 90 | 0.29 | 4.2 | 0.15 | 33 | 5.9 | 20.13 | 0.99 |
| Jan-82 | n/a | n/a | 383 | 61 | 0.19 | 8.3 | 0.33 | 46 | 5.3 | 20.34 | 1.02 |
| Feb-82 | n/a | n/a | 248 | 24 | 0.06 | 5.4 | 0.20 | 29 | 1.9 | 20.14 | 1.05 |
| Mar-82 | n/a | n/a | 250 | 24 | 0.06 | 3.3 | 0.11 | 24 | 1.8 | 19.94 | 1.06 |
| Apr-82 | n/a | n/a | 154 | 10 | 0.01 | 4.1 | 0.14 | 26 | 0.5 | 19.79 | 1.03 |
| May-82 | n/a | n/a | 172 | 10 | 0.01 | 3.8 | 0.13 | 31 | 0.5 | 19.48 | 1.04 |
| Jun-82 | n/a | n/a | 243 | 23 | 0.05 | 3.5 | 0.12 | 31 | 1.7 | 19.29 | 1.04 |
| ***Jul-82*** | n/a | n/a | 318 | 43 | 0.13 | 3.5 | 0.12 | 36 | 3.1 | 19.13 | 1.04 |
| Aug-82 | n/a | n/a | 356 | 53 | 0.16 | 3.1 | 0.10 | 34 | 3.6 | 19.16 | 1.04 |
| Sep-82 | n/a | n/a | 402 | 66 | 0.21 | 2.6 | 0.08 | 30 | 4.1 | 19.17 | 1.05 |
| Oct-82 | n/a | n/a | 289 | 35 | 0.10 | 3.0 | 0.10 | 27 | 2.5 | 18.99 | 1.05 |
| Nov-82 | n/a | n/a | 262 | 28 | 0.07 | 3.4 | 0.11 | 25 | 2.0 | 18.23 | 1.05 |
| Dec-82 | n/a | n/a | 151 | 10 | 0.01 | 3.6 | 0.12 | 21 | 0.5 | 17.54 | 1.06 |
| Jan-83 | n/a | n/a | 217 | 15 | 0.03 | 4.0 | 0.14 | 21 | 1.1 | 16.79 | 1.06 |
| Feb-83 | n/a | n/a | 153 | 10 | 0.01 | 4.8 | 0.17 | 24 | 0.5 | 16.62 | 1.04 |
| Mar-83 | n/a | n/a | 198 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | 16.59 | 1.03 |
| Apr-83 | n/a | n/a | 186 | 10 | 0.01 | 5.2 | 0.19 | 32 | 0.5 | 16.49 | 1.02 |
| May-83 | n/a | n/a | 157 | 10 | 0.01 | 4.8 | 0.17 | 32 | 0.5 | 16.38 | 1.03 |
| Jun-83 | n/a | n/a | 153 | 10 | 0.01 | 3.9 | 0.13 | 32 | 0.5 | 16.23 | 1.05 |
| Jul-83 | n/a | n/a | 189 | 10 | 0.01 | 3.5 | 0.12 | 29 | 0.5 | 16.03 | 1.05 |
| Aug-83 | n/a | n/a | 275 | 31 | 0.08 | 2.9 | 0.09 | 27 | 2.2 | 15.79 | 1.06 |
| Sep-83 | n/a | n/a | 350 | 52 | 0.16 | 2.8 | 0.08 | 30 | 3.4 | 15.69 | 1.06 |
| Oct-83 | n/a | n/a | 272 | 31 | 0.08 | 3.2 | 0.10 | 28 | 2.2 | 15.57 | 1.06 |
| Nov-83 | n/a | n/a | 201 | 11 | 0.01 | 3.3 | 0.11 | 22 | 0.6 | 15.05 | 1.06 |
| Dec-83 | n/a | n/a | 156 | 10 | 0.01 | 3.8 | 0.13 | 21 | 0.5 | 14.53 | 1.07 |
| Jan-84 | n/a | n/a | 175 | 10 | 0.01 | 4.4 | 0.16 | 19 | 0.5 | 13.54 | 1.05 |
| Feb-84 | n/a | n/a | 267 | 29 | 0.08 | 3.5 | 0.12 | 23 | 2.2 | 12.68 | 1.05 |
| Mar-84 | n/a | n/a | 347 | 51 | 0.16 | 3.1 | 0.10 | 27 | 3.5 | 12.30 | 1.05 |
| ***Apr-84*** | n/a | n/a | 375 | 59 | 0.18 | 2.9 | 0.09 | 31 | 3.9 | 12.03 | 1.04 |
| May-84 | n/a | n/a | 354 | 53 | 0.16 | 3.0 | 0.10 | 33 | 3.6 | 11.93 | 1.04 |
| ***Jun-84*** | n/a | n/a | 357 | 54 | 0.16 | 3.1 | 0.10 | 34 | 3.6 | 11.95 | 1.04 |
| ***Jul-84*** | n/a | n/a | 307 | 40 | 0.12 | 2.9 | 0.09 | 30 | 2.8 | 11.96 | 1.04 |
| Aug-84 | n/a | n/a | 321 | 44 | 0.13 | 2.7 | 0.08 | 29 | 3.0 | 11.90 | 1.04 |
| Sep-84 | n/a | n/a | 415 | 69 | 0.22 | 2.6 | 0.08 | 32 | 4.3 | 11.60 | 1.04 |
| Oct-84 | n/a | n/a | 570 | 112 | 0.37 | 2.7 | 0.08 | 38 | 6.3 | 11.33 | 1.04 |
| Nov-84 | n/a | n/a | 630 | 128 | 0.43 | 2.9 | 0.09 | 39 | 7.3 | 11.35 | 1.04 |
| Dec-84 | n/a | n/a | 481 | 87 | 0.29 | 3.9 | 0.13 | 35 | 5.9 | 11.19 | 1.04 |
| ***Jan-85*** | n/a | n/a | 454 | 80 | 0.26 | 4.2 | 0.15 | 28 | 5.4 | 11.17 | 1.04 |
| ***Feb-85*** | n/a | n/a | 533 | 102 | 0.34 | 4.0 | 0.14 | 35 | 6.4 | 11.34 | 1.00 |
| Mar-85 | n/a | n/a | 525 | 99 | 0.33 | 4.0 | 0.14 | 39 | 6.3 | 12.02 | 0.99 |
| Apr-85 | n/a | n/a | 502 | 93 | 0.31 | 4.0 | 0.14 | 43 | 6.0 | 12.67 | 1.00 |
| May-85 | n/a | n/a | 411 | 68 | 0.22 | 3.6 | 0.12 | 42 | 4.7 | 13.05 | 0.98 |
| Jun-85 | n/a | n/a | 354 | 47 | 0.14 | 3.2 | 0.10 | 34 | 3.3 | 13.30 | 0.97 |
| ***Jul-85*** | n/a | n/a | 345 | 50 | 0.15 | 2.7 | 0.08 | 30 | 3.3 | 13.50 | 0.96 |
| Aug-85 | n/a | n/a | 479 | 87 | 0.28 | 2.6 | 0.08 | 35 | 5.1 | 13.59 | 0.96 |
| Sep-85 | n/a | n/a | 502 | 93 | 0.31 | 2.5 | 0.08 | 35 | 5.4 | 13.89 | 0.95 |
| Oct-85 | n/a | n/a | 662 | 137 | 0.46 | 2.8 | 0.09 | 45 | 7.5 | 14.02 | 0.95 |
| Nov-85 | n/a | n/a | 649 | 133 | 0.45 | 3.0 | 0.09 | 41 | 7.5 | 14.60 | 0.94 |
| Dec-85 | n/a | n/a | 617 | 125 | 0.42 | 4.2 | 0.15 | 40 | 7.6 | 15.08 | 0.92 |
| Jan-86 | n/a | n/a | 576 | 113 | 0.38 | 5.3 | 0.19 | 42 | 7.6 | 16.07 | 0.93 |
| Feb-86 | n/a | n/a | 362 | 55 | 0.17 | 10.0 | 0.40 | 59 | 5.1 | 16.91 | 0.94 |
| Mar-86 | n/a | n/a | 205 | 12 | 0.02 | 4.5 | 0.16 | 25 | 0.7 | 17.33 | 1.00 |
| Apr-86 | n/a | n/a | 230 | 19 | 0.04 | 4.0 | 0.14 | 27 | 1.3 | 17.40 | 1.02 |
| ***May-86*** | n/a | n/a | 263 | 28 | 0.07 | 3.6 | 0.12 | 33 | 2.1 | 17.49 | 1.02 |
| Jun-86 | n/a | n/a | 277 | 32 | 0.09 | 3.5 | 0.12 | 33 | 2.4 | 17.53 | 1.00 |
| ***Jul-86*** | n/a | n/a | 349 | 52 | 0.16 | 3.9 | 0.13 | 42 | 3.8 | 17.65 | 0.98 |
| Aug-86 | n/a | n/a | 405 | 67 | 0.21 | 3.7 | 0.13 | 44 | 4.6 | 17.61 | 0.96 |
| Sep-86 | n/a | n/a | 424 | 72 | 0.23 | 2.9 | 0.09 | 35 | 4.6 | 17.77 | 0.95 |

Table 2B-4 Monthly Average Water Quality at
Tracy Pumping Plant: Base Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | n/a | n/a | 535 | 102 | 0.34 | 2.6 | 0.08 | 35 | 5.9 | 17.94 | 0.96 |
| Nov-86 | n/a | n/a | 528 | 101 | 0.33 | 2.8 | 0.09 | 32 | 5.9 | 18.56 | 0.95 |
| Dec-86 | n/a | n/a | 627 | 127 | 0.43 | 3.1 | 0.10 | 35 | 7.3 | 19.35 | 0.95 |
| Jan-87 | n/a | n/a | 638 | 131 | 0.44 | 3.3 | 0.11 | 34 | 7.6 | 20.12 | 0.96 |
| Feb-87 | n/a | n/a | 717 | 152 | 0.52 | 3.6 | 0.12 | 48 | ***8.8*** | 20.57 | 0.95 |
| Mar-87 | n/a | n/a | 597 | 119 | 0.40 | 4.8 | 0.18 | 51 | 7.7 | 20.93 | 0.94 |
| Apr-87 | n/a | n/a | 449 | 79 | 0.25 | 5.2 | 0.19 | 50 | 5.6 | 21.21 | 0.95 |
| ***May-87*** | n/a | n/a | 420 | 71 | 0.23 | 4.1 | 0.14 | 41 | 4.8 | 21.22 | 0.96 |
| ***Jun-87*** | n/a | n/a | 356 | 53 | 0.16 | 3.3 | 0.11 | 36 | 3.7 | 21.28 | 0.96 |
| ***Jul-87*** | n/a | n/a | 319 | 43 | 0.13 | 2.9 | 0.09 | 30 | 3.0 | 21.29 | 0.96 |
| Aug-87 | n/a | n/a | 401 | 66 | 0.21 | 2.8 | 0.09 | 34 | 4.2 | 21.32 | 0.96 |
| Sep-87 | n/a | n/a | 480 | 87 | 0.28 | 2.8 | 0.09 | 38 | 5.3 | 21.53 | 0.96 |
| Oct-87 | n/a | n/a | 681 | 142 | 0.48 | 2.9 | 0.09 | 48 | 7.8 | 21.41 | 0.95 |
| Nov-87 | n/a | n/a | 657 | 136 | 0.46 | 3.0 | 0.10 | 42 | 7.6 | 21.35 | 0.95 |
| Dec-87 | n/a | n/a | 675 | 141 | 0.48 | 3.4 | 0.11 | 41 | ***8.1*** | 20.79 | 0.94 |
| Jan-88 | n/a | n/a | 650 | 134 | 0.45 | 4.9 | 0.18 | 44 | ***8.4*** | 21.25 | 0.93 |
| ***Feb-88*** | n/a | n/a | 535 | 102 | 0.34 | 5.8 | 0.22 | 49 | 7.2 | 21.71 | 0.94 |
| Mar-88 | n/a | n/a | 566 | 111 | 0.37 | 6.1 | 0.23 | 59 | 7.8 | 21.65 | 0.95 |
| Apr-88 | n/a | n/a | 528 | 100 | 0.33 | 5.1 | 0.19 | 56 | 6.8 | 21.39 | 0.95 |
| May-88 | n/a | n/a | 464 | 83 | 0.27 | 4.8 | 0.17 | 51 | 5.7 | 21.23 | 0.94 |
| Jun-88 | n/a | n/a | 474 | 86 | 0.28 | 4.5 | 0.16 | 50 | 5.8 | 21.10 | 0.94 |
| Jul-88 | n/a | n/a | 437 | 76 | 0.24 | 4.1 | 0.14 | 43 | 5.1 | 20.93 | 0.92 |
| Aug-88 | n/a | n/a | 490 | 90 | 0.30 | 4.0 | 0.14 | 46 | 5.8 | 20.63 | 0.91 |
| Sep-88 | n/a | n/a | 570 | 112 | 0.37 | 3.4 | 0.11 | 51 | 6.8 | 20.08 | 0.90 |
| Oct-88 | n/a | n/a | 712 | 151 | 0.51 | 3.2 | 0.10 | 54 | ***8.4*** | 20.11 | 0.90 |
| Nov-88 | n/a | n/a | 712 | 151 | 0.51 | 3.1 | 0.10 | 46 | ***8.4*** | 19.93 | 0.90 |
| Dec-88 | n/a | n/a | 673 | 140 | 0.47 | 3.2 | 0.10 | 39 | 8.0 | 19.98 | 0.90 |
| Jan-89 | n/a | n/a | 686 | 144 | 0.49 | 3.4 | 0.11 | 38 | ***8.3*** | 19.95 | 0.88 |
| Feb-89 | n/a | n/a | 724 | 154 | 0.52 | 3.8 | 0.13 | 51 | ***9.1*** | 20.21 | 0.87 |
| Mar-89 | n/a | n/a | 543 | 105 | 0.35 | 5.9 | 0.22 | 56 | 7.4 | 20.10 | 0.79 |
| Apr-89 | n/a | n/a | 357 | 54 | 0.16 | 5.7 | 0.21 | 46 | 4.2 | 20.89 | 0.80 |
| May-89 | n/a | n/a | 356 | 53 | 0.16 | 5.2 | 0.19 | 46 | 4.1 | 21.04 | 0.80 |
| ***Jun-89*** | n/a | n/a | 313 | 42 | 0.12 | 3.6 | 0.12 | 37 | 3.1 | 21.14 | 0.81 |
| ***Jul-89*** | n/a | n/a | 361 | 55 | 0.17 | 3.3 | 0.11 | 36 | 3.8 | 21.14 | 0.80 |
| Aug-89 | n/a | n/a | 378 | 60 | 0.19 | 2.9 | 0.09 | 33 | 3.9 | 21.47 | 0.82 |
| Sep-89 | n/a | n/a | 467 | 89 | 0.29 | 2.7 | 0.08 | 36 | 5.3 | 21.39 | 0.81 |
| Oct-89 | n/a | n/a | 653 | 134 | 0.45 | 2.7 | 0.08 | 43 | 7.4 | 21.55 | 0.81 |
| Nov-89 | n/a | n/a | 628 | 128 | 0.43 | 2.9 | 0.09 | 39 | 7.2 | 21.42 | 0.80 |
| Dec-89 | n/a | n/a | 626 | 127 | 0.43 | 3.4 | 0.11 | 39 | 7.6 | 20.98 | 0.79 |
| Jan-90 | n/a | n/a | 693 | 146 | 0.49 | 3.8 | 0.13 | 43 | ***8.7*** | 20.88 | 0.79 |
| Feb-90 | n/a | n/a | 685 | 145 | 0.49 | 5.4 | 0.20 | 57 | ***9.2*** | 21.64 | 0.81 |
| Mar-90 | n/a | n/a | 573 | 113 | 0.38 | 5.8 | 0.22 | 57 | 7.8 | 22.35 | 0.84 |
| Apr-90 | n/a | n/a | 605 | 121 | 0.41 | 5.4 | 0.20 | ***65*** | ***8.0*** | 22.35 | 0.85 |
| May-90 | n/a | n/a | 460 | 82 | 0.27 | 5.1 | 0.19 | 53 | 5.8 | 22.08 | 0.83 |
| Jun-90 | n/a | n/a | 446 | 78 | 0.25 | 4.2 | 0.15 | 45 | 5.2 | 21.96 | 0.82 |
| Jul-90 | n/a | n/a | 462 | 82 | 0.27 | 4.3 | 0.15 | 47 | 5.5 | 21.57 | 0.80 |
| Aug-90 | n/a | n/a | 517 | 97 | 0.32 | 4.3 | 0.15 | 51 | 6.3 | 21.27 | 0.78 |
| Sep-90 | n/a | n/a | 566 | 111 | 0.37 | 3.6 | 0.12 | 53 | 6.9 | 20.91 | 0.76 |
| Oct-90 | n/a | n/a | 761 | 164 | 0.56 | 3.2 | 0.11 | 59 | ***9.0*** | 20.98 | 0.76 |
| Nov-90 | n/a | n/a | 720 | 153 | 0.52 | 3.2 | 0.10 | 48 | ***8.5*** | 20.89 | 0.76 |
| Dec-90 | n/a | n/a | 615 | 134 | 0.42 | 3.1 | 0.10 | 35 | 7.2 | 20.73 | 0.76 |
| Jan-91 | n/a | n/a | 694 | 146 | 0.49 | 3.5 | 0.12 | 39 | ***8.4*** | 20.09 | 0.74 |
| Feb-91 | n/a | n/a | 802 | 175 | 0.60 | 4.0 | 0.14 | 59 | ***10.2*** | 19.45 | 0.71 |
| Mar-91 | n/a | n/a | 602 | 121 | 0.40 | 5.7 | 0.21 | 59 | ***8.1*** | 19.26 | 0.68 |
| Apr-91 | n/a | n/a | 412 | 69 | 0.22 | 6.0 | 0.23 | 53 | 5.3 | 19.68 | 0.70 |
| May-91 | n/a | n/a | 384 | 61 | 0.19 | 5.0 | 0.18 | 47 | 4.5 | 19.62 | 0.70 |
| Jun-91 | n/a | n/a | 444 | 77 | 0.25 | 4.2 | 0.15 | 45 | 5.2 | 19.61 | 0.71 |
| Jul-91 | n/a | n/a | 459 | 81 | 0.26 | 4.3 | 0.15 | 47 | 5.5 | 19.37 | 0.69 |
| Aug-91 | n/a | n/a | 514 | 97 | 0.32 | 4.4 | 0.15 | 52 | 6.3 | 19.28 | 0.69 |
| Sep-91 | n/a | n/a | 557 | 108 | 0.36 | 3.6 | 0.12 | 53 | 6.8 | 19.16 | 0.68 |

1. Project Release Months are shown in ***Bold***
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***

Table 2B-5 Monthly Average Water Quality at
Rock Slough: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 563 | 127 | 0.43 | 2.0 | 0.05 | 30 | 6.4 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 420 | 88 | 0.29 | 2.3 | 0.07 | 25 | 5.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 712 | 167 | 0.57 | 2.8 | 0.09 | 38 | ***8.7*** | n/a | n/a |
| Jan-76 | 0 | 0 | 731 | 172 | 0.59 | 2.8 | 0.09 | 36 | ***9.0*** | n/a | n/a |
| Feb-76 | 0 | 0 | 711 | 167 | 0.57 | 2.6 | 0.08 | 38 | ***8.6*** | n/a | n/a |
| Mar-76 | 0 | 0 | 424 | 90 | 0.29 | 2.5 | 0.07 | 27 | 5.2 | n/a | n/a |
| Apr-76 | 0 | 0 | 325 | 63 | 0.20 | 2.6 | 0.08 | 28 | 4.0 | n/a | n/a |
| May-76 | 0 | 0 | 342 | 68 | 0.21 | 2.7 | 0.08 | 32 | 4.3 | n/a | n/a |
| Jun-76 | 0 | 0 | 379 | 78 | 0.25 | 2.4 | 0.07 | 31 | 4.6 | n/a | n/a |
| Jul-76 | 0 | 0 | 447 | 96 | 0.32 | 2.4 | 0.07 | 33 | 5.4 | n/a | n/a |
| Aug-76 | 0 | 0 | 591 | 134 | 0.45 | 2.3 | 0.07 | 40 | 7.0 | n/a | n/a |
| Sep-76 | 0 | 0 | 566 | 128 | 0.43 | 2.2 | 0.06 | 36 | 6.6 | n/a | n/a |
| Oct-76 | 0 | 0 | 819 | 196 | 0.67 | 2.3 | 0.07 | 49 | ***9.3*** | n/a | n/a |
| Nov-76 | 0 | 0 | 771 | 183 | 0.63 | 2.3 | 0.07 | 40 | ***8.8*** | n/a | n/a |
| Dec-76 | 0 | 0 | 577 | 131 | 0.44 | 2.1 | 0.06 | 25 | 6.7 | n/a | n/a |
| Jan-77 | 0 | 0 | 850 | 204 | 0.70 | 2.4 | 0.07 | 36 | ***9.8*** | n/a | n/a |
| Feb-77 | 0 | 0 | 846 | 203 | 0.70 | 3.0 | 0.09 | 50 | ***10.3*** | n/a | n/a |
| Mar-77 | 0 | 0 | 611 | 140 | 0.47 | 3.2 | 0.10 | 45 | 8.0 | n/a | n/a |
| Apr-77 | 0 | 0 | 409 | 86 | 0.28 | 2.6 | 0.08 | 33 | 5.1 | n/a | n/a |
| May-77 | 0 | 0 | 431 | 92 | 0.30 | 2.7 | 0.08 | 36 | 5.4 | n/a | n/a |
| Jun-77 | 0 | 0 | 586 | 133 | 0.45 | 2.8 | 0.09 | 48 | 7.4 | n/a | n/a |
| Jul-77 | 0 | 0 | 534 | 119 | 0.40 | 2.7 | 0.08 | 43 | 6.7 | n/a | n/a |
| Aug-77 | 0 | 0 | 450 | 97 | 0.32 | 2.6 | 0.08 | 37 | 5.6 | n/a | n/a |
| Sep-77 | 0 | 0 | 751 | 177 | 0.61 | 2.4 | 0.07 | 51 | ***8.8*** | n/a | n/a |
| Oct-77 | 0 | 0 | 934 | ***226*** | 0.78 | 2.4 | 0.07 | 57 | ***10.5*** | n/a | n/a |
| Nov-77 | 0 | 0 | 837 | 200 | 0.69 | 2.4 | 0.07 | 45 | ***9.6*** | n/a | n/a |
| Dec-77 | 0 | 0 | 996 | ***243*** | 0.84 | 2.7 | 0.08 | 52 | ***11.5*** | n/a | n/a |
| Jan-78 | 0 | 0 | 490 | 107 | 0.36 | 5.2 | 0.19 | 40 | 7.2 | n/a | n/a |
| Feb-78 | 0 | 0 | 284 | 52 | 0.16 | 6.1 | 0.23 | 38 | 4.2 | n/a | n/a |
| Mar-78 | 0 | 0 | 289 | 53 | 0.16 | 5.7 | 0.21 | 40 | 4.2 | n/a | n/a |
| Apr-78 | 0 | 0 | 276 | 50 | 0.15 | 4.1 | 0.14 | 34 | 3.6 | n/a | n/a |
| May-78 | 0 | 0 | 220 | 35 | 0.10 | 3.4 | 0.11 | 33 | 2.6 | n/a | n/a |
| Jun-78 | 0 | 0 | 223 | 36 | 0.10 | 3.2 | 0.10 | 31 | 2.6 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 241 | 41 | 0.12 | 3.3 | 0.11 | 33 | 2.9 | n/a | n/a |
| Aug-78 | 0 | 0 | 312 | 60 | 0.19 | 2.4 | 0.07 | 28 | 3.7 | n/a | n/a |
| Sep-78 | 0 | 0 | 578 | 131 | 0.44 | 2.2 | 0.06 | 36 | 6.7 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 642 | 148 | 0.50 | 2.1 | 0.06 | 36 | 7.4 | 1.76 | 0.04 |
| Nov-78 | 0 | 0 | 634 | 146 | 0.50 | 2.2 | 0.06 | 32 | 7.3 | 1.83 | 0.04 |
| Dec-78 | 0 | 0 | 811 | 194 | 0.67 | 2.2 | 0.06 | 34 | ***9.1*** | 1.85 | 0.04 |
| Jan-79 | 0 | 0 | 628 | 144 | 0.49 | 3.0 | 0.10 | 34 | ***8.0*** | 1.87 | 0.04 |
| Feb-79 | 0 | 0 | 345 | 69 | 0.22 | 4.5 | 0.16 | 33 | 4.8 | 1.86 | 0.04 |
| Mar-79 | 0 | 0 | 262 | 46 | 0.14 | 4.2 | 0.15 | 30 | 3.4 | 1.84 | 0.04 |
| Apr-79 | 0 | 0 | 245 | 42 | 0.12 | 2.9 | 0.09 | 28 | 2.9 | 1.82 | 0.04 |
| May-79 | 0 | 0 | 255 | 44 | 0.13 | 3.0 | 0.10 | 31 | 3.1 | 1.82 | 0.04 |
| ***Jun-79*** | 350 | 0 | 234 | 39 | 0.11 | 2.6 | 0.08 | 26 | 2.6 | 1.82 | 0.05 |
| ***Jul-79*** | 1415 | 1558 | 262 | 46 | 0.14 | 3.0 | 0.09 | 31 | 3.2 | 1.82 | 0.05 |
| Aug-79 | 0 | 0 | 368 | 75 | 0.24 | 2.3 | 0.06 | 29 | 4.4 | 1.82 | 0.05 |
| Sep-79 | 0 | 0 | 641 | 148 | 0.50 | 2.2 | 0.06 | 39 | 7.4 | 1.83 | 0.05 |
| Oct-79 | 0 | 0 | 817 | 195 | 0.67 | 2.1 | 0.06 | 44 | ***9.1*** | 1.84 | 0.05 |
| Nov-79 | 0 | 0 | 624 | 143 | 0.49 | 2.2 | 0.06 | 31 | 7.2 | 1.83 | 0.05 |
| Dec-79 | 0 | 0 | 592 | 135 | 0.45 | 2.5 | 0.07 | 30 | 7.2 | 1.86 | 0.05 |
| Jan-80 | 0 | 0 | 433 | 92 | 0.30 | 4.8 | 0.18 | 35 | 6.3 | 1.89 | 0.05 |
| Feb-80 | 0 | 0 | 247 | 42 | 0.12 | 6.1 | 0.23 | 36 | 3.5 | 1.86 | 0.05 |
| Mar-80 | 0 | 0 | 197 | 29 | 0.08 | 4.0 | 0.14 | 29 | 2.2 | 1.80 | 0.05 |
| Apr-80 | 0 | 0 | 245 | 42 | 0.12 | 3.2 | 0.10 | 30 | 3.0 | 1.75 | 0.05 |
| May-80 | 0 | 0 | 246 | 42 | 0.12 | 2.8 | 0.09 | 29 | 2.9 | 1.72 | 0.05 |
| Jun-80 | 0 | 0 | 242 | 41 | 0.12 | 2.8 | 0.09 | 29 | 2.8 | 1.70 | 0.05 |
| ***Jul-80*** | 1844 | 1601 | 248 | 43 | 0.12 | 3.4 | 0.11 | 35 | 3.1 | 1.66 | 0.05 |
| Aug-80 | 0 | 0 | 281 | 51 | 0.16 | 2.4 | 0.07 | 27 | 3.3 | 1.61 | 0.05 |
| Sep-80 | 0 | 0 | 505 | 111 | 0.37 | 2.2 | 0.06 | 32 | 5.9 | 1.60 | 0.05 |
| ***Oct-80*** | 49 | 0 | 579 | 131 | 0.44 | 2.2 | 0.06 | 34 | 6.7 | 1.55 | 0.05 |
| Nov-80 | 0 | 0 | 543 | 122 | 0.41 | 2.2 | 0.06 | 28 | 6.4 | 1.51 | 0.05 |
| Dec-80 | 0 | 0 | 657 | 152 | 0.52 | 2.2 | 0.06 | 29 | 7.6 | 1.47 | 0.05 |
| Jan-81 | 0 | 0 | 788 | 187 | 0.64 | 2.6 | 0.08 | 36 | ***9.4*** | 1.43 | 0.05 |
| Feb-81 | 0 | 0 | 362 | 78 | 0.25 | 2.9 | 0.09 | 27 | 4.9 | 1.45 | 0.05 |
| Mar-81 | 0 | 0 | 253 | 44 | 0.13 | 3.2 | 0.10 | 26 | 3.1 | 1.45 | 0.05 |

Table 2B-5 Monthly Average Water Quality at
Rock Slough: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 241 | 41 | 0.12 | 3.0 | 0.09 | 28 | 2.8 | 1.44 | 0.05 |
| ***May-81*** | 19 | 0 | 305 | 58 | 0.18 | 3.0 | 0.10 | 33 | 3.6 | 1.43 | 0.05 |
| ***Jun-81*** | 439 | 0 | 283 | 52 | 0.16 | 2.5 | 0.07 | 27 | 3.3 | 1.44 | 0.05 |
| ***Jul-81*** | 664 | 283 | 327 | 64 | 0.20 | 2.4 | 0.07 | 28 | 3.9 | 1.47 | 0.05 |
| Aug-81 | 0 | 0 | 535 | 119 | 0.40 | 2.2 | 0.06 | 35 | 6.3 | 1.47 | 0.04 |
| Sep-81 | 0 | 0 | 683 | 159 | 0.54 | 2.1 | 0.06 | 40 | 7.7 | 1.49 | 0.04 |
| Oct-81 | 0 | 0 | 824 | 197 | 0.68 | 2.1 | 0.06 | 45 | ***9.1*** | 1.45 | 0.04 |
| Nov-81 | 0 | 0 | 767 | 182 | 0.62 | 2.6 | 0.08 | 46 | ***9.2*** | 1.42 | 0.04 |
| Dec-81 | 0 | 0 | 326 | 63 | 0.20 | 4.8 | 0.18 | 32 | 4.6 | 1.43 | 0.04 |
| Jan-82 | 0 | 0 | 269 | 48 | 0.14 | 4.5 | 0.16 | 25 | 3.6 | 1.39 | 0.04 |
| Feb-82 | 0 | 0 | 305 | 58 | 0.18 | 4.9 | 0.18 | 33 | 4.3 | 1.36 | 0.04 |
| Mar-82 | 0 | 0 | 307 | 58 | 0.18 | 4.9 | 0.18 | 38 | 4.3 | 1.36 | 0.04 |
| Apr-82 | 0 | 0 | 227 | 37 | 0.10 | 4.4 | 0.15 | 33 | 2.8 | 1.34 | 0.04 |
| May-82 | 0 | 0 | 183 | 25 | 0.06 | 3.7 | 0.12 | 33 | 1.9 | 1.34 | 0.04 |
| Jun-82 | 0 | 0 | 215 | 33 | 0.09 | 2.9 | 0.09 | 28 | 2.3 | 1.34 | 0.04 |
| ***Jul-82*** | 1836 | 1613 | 242 | 41 | 0.12 | 3.4 | 0.11 | 34 | 3.0 | 1.33 | 0.04 |
| Aug-82 | 0 | 0 | 319 | 61 | 0.19 | 2.5 | 0.07 | 29 | 3.8 | 1.33 | 0.04 |
| Sep-82 | 0 | 0 | 507 | 112 | 0.37 | 2.1 | 0.06 | 31 | 5.9 | 1.32 | 0.04 |
| Oct-82 | 0 | 0 | 293 | 55 | 0.17 | 2.4 | 0.07 | 24 | 3.4 | 1.30 | 0.04 |
| Nov-82 | 0 | 0 | 224 | 36 | 0.10 | 3.2 | 0.10 | 25 | 2.6 | 1.23 | 0.04 |
| Dec-82 | 0 | 0 | 290 | 54 | 0.17 | 3.9 | 0.13 | 29 | 3.9 | 1.19 | 0.04 |
| Jan-83 | 0 | 0 | 296 | 55 | 0.17 | 4.4 | 0.16 | 26 | 4.0 | 1.17 | 0.04 |
| Feb-83 | 0 | 0 | 141 | 14 | 0.02 | 4.8 | 0.18 | 24 | 0.9 | 1.16 | 0.04 |
| Mar-83 | 0 | 0 | 171 | 22 | 0.05 | 5.5 | 0.20 | 32 | 1.8 | 1.16 | 0.04 |
| Apr-83 | 0 | 0 | 188 | 26 | 0.07 | 5.1 | 0.19 | 35 | 2.1 | 1.15 | 0.04 |
| May-83 | 0 | 0 | 190 | 27 | 0.07 | 4.9 | 0.18 | 37 | 2.1 | 1.15 | 0.04 |
| Jun-83 | 0 | 0 | 139 | 13 | 0.02 | 3.6 | 0.12 | 30 | 0.8 | 1.15 | 0.04 |
| Jul-83 | 0 | 0 | 179 | 24 | 0.06 | 3.2 | 0.10 | 29 | 1.7 | 1.12 | 0.04 |
| Aug-83 | 0 | 0 | 244 | 41 | 0.12 | 2.3 | 0.07 | 24 | 2.6 | 1.11 | 0.04 |
| Sep-83 | 0 | 0 | 292 | 54 | 0.17 | 2.2 | 0.06 | 23 | 3.3 | 1.10 | 0.04 |
| Oct-83 | 0 | 0 | 237 | 40 | 0.11 | 2.7 | 0.08 | 25 | 2.7 | 1.07 | 0.04 |
| Nov-83 | 0 | 0 | 211 | 32 | 0.09 | 3.5 | 0.12 | 26 | 2.4 | 1.03 | 0.04 |
| Dec-83 | 0 | 0 | 159 | 19 | 0.04 | 3.9 | 0.13 | 23 | 1.4 | 0.99 | 0.05 |
| Jan-84 | 0 | 0 | 181 | 25 | 0.06 | 4.1 | 0.15 | 20 | 1.8 | 0.95 | 0.05 |
| Feb-84 | 0 | 0 | 242 | 41 | 0.12 | 3.3 | 0.11 | 24 | 2.9 | 0.91 | 0.05 |
| Mar-84 | 0 | 0 | 242 | 41 | 0.12 | 2.6 | 0.08 | 21 | 2.7 | 0.91 | 0.05 |
| ***Apr-84*** | 188 | 0 | 245 | 42 | 0.12 | 2.2 | 0.06 | 21 | 2.6 | 0.91 | 0.05 |
| May-84 | 0 | 0 | 290 | 54 | 0.16 | 2.5 | 0.07 | 27 | 3.4 | 0.91 | 0.05 |
| ***Jun-84*** | 731 | 0 | 262 | 46 | 0.14 | 2.3 | 0.07 | 25 | 2.9 | 0.90 | 0.05 |
| ***Jul-84*** | 873 | 1535 | 230 | 38 | 0.11 | 2.9 | 0.09 | 29 | 2.6 | 0.90 | 0.05 |
| Aug-84 | 0 | 0 | 264 | 47 | 0.14 | 2.2 | 0.06 | 23 | 2.9 | 0.88 | 0.05 |
| Sep-84 | 0 | 0 | 503 | 111 | 0.37 | 2.1 | 0.06 | 32 | 5.9 | 0.83 | 0.05 |
| Oct-84 | 0 | 0 | 648 | 150 | 0.51 | 2.1 | 0.06 | 38 | 7.4 | 0.81 | 0.05 |
| Nov-84 | 0 | 0 | 683 | 159 | 0.54 | 2.6 | 0.08 | 40 | ***8.2*** | 0.78 | 0.05 |
| Dec-84 | 0 | 0 | 358 | 72 | 0.23 | 3.4 | 0.11 | 29 | 4.6 | 0.77 | 0.05 |
| ***Jan-85*** | 399 | 0 | 378 | 77 | 0.25 | 3.4 | 0.11 | 27 | 5.1 | 0.77 | 0.05 |
| ***Feb-85*** | 61 | 0 | 414 | 87 | 0.28 | 3.1 | 0.10 | 30 | 5.4 | 0.78 | 0.05 |
| Mar-85 | 0 | 0 | 310 | 59 | 0.18 | 3.0 | 0.09 | 27 | 3.9 | 0.79 | 0.05 |
| Apr-85 | 0 | 0 | 279 | 51 | 0.15 | 3.0 | 0.10 | 30 | 3.4 | 0.79 | 0.05 |
| May-85 | 0 | 0 | 308 | 59 | 0.18 | 2.9 | 0.09 | 32 | 3.8 | 0.79 | 0.05 |
| Jun-85 | 0 | 0 | 264 | 47 | 0.14 | 2.4 | 0.07 | 26 | 3.0 | 0.81 | 0.04 |
| ***Jul-85*** | 38 | 0 | 396 | 82 | 0.27 | 2.2 | 0.06 | 29 | 4.7 | 0.82 | 0.04 |
| Aug-85 | 0 | 0 | 606 | 138 | 0.47 | 2.1 | 0.06 | 37 | 6.9 | 0.85 | 0.04 |
| Sep-85 | 0 | 0 | 580 | 132 | 0.44 | 2.1 | 0.06 | 34 | 6.6 | 0.90 | 0.04 |
| Oct-85 | 0 | 0 | 713 | 167 | 0.57 | 2.1 | 0.06 | 40 | ***8.1*** | 0.91 | 0.04 |
| Nov-85 | 0 | 0 | 691 | 161 | 0.55 | 2.2 | 0.06 | 35 | 7.9 | 0.97 | 0.04 |
| Dec-85 | 0 | 0 | 622 | 143 | 0.48 | 3.0 | 0.10 | 38 | 8.0 | 1.00 | 0.04 |
| Jan-86 | 0 | 0 | 597 | 136 | 0.46 | 4.3 | 0.15 | 39 | ***8.2*** | 1.03 | 0.04 |
| Feb-86 | 0 | 0 | 354 | 71 | 0.23 | 7.7 | 0.30 | 52 | 5.9 | 1.05 | 0.04 |
| Mar-86 | 0 | 0 | 193 | 28 | 0.07 | 5.8 | 0.22 | 35 | 2.3 | 1.05 | 0.04 |
| Apr-86 | 0 | 0 | 228 | 37 | 0.11 | 4.2 | 0.15 | 32 | 2.8 | 1.06 | 0.04 |
| ***May-86*** | 290 | 0 | 238 | 40 | 0.11 | 3.4 | 0.11 | 33 | 2.9 | 1.06 | 0.04 |
| Jun-86 | 0 | 0 | 248 | 42 | 0.12 | 3.0 | 0.10 | 31 | 2.9 | 1.08 | 0.04 |
| ***Jul-86*** | 1837 | 1535 | 261 | 46 | 0.14 | 3.9 | 0.13 | 40 | 3.4 | 1.09 | 0.04 |
| Aug-86 | 0 | 0 | 267 | 47 | 0.14 | 2.6 | 0.08 | 28 | 3.1 | 1.10 | 0.04 |
| Sep-86 | 0 | 0 | 444 | 95 | 0.31 | 2.2 | 0.06 | 31 | 5.3 | 1.11 | 0.04 |

Table 2B-5 Monthly Average Water Quality at
Rock Slough: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 473 | 103 | 0.34 | 2.1 | 0.06 | 28 | 5.5 | 1.13 | 0.04 |
| Nov-86 | 0 | 0 | 532 | 119 | 0.40 | 2.2 | 0.06 | 28 | 6.2 | 1.16 | 0.04 |
| Dec-86 | 0 | 0 | 759 | 180 | 0.62 | 2.2 | 0.06 | 33 | ***8.6*** | 1.20 | 0.04 |
| Jan-87 | 0 | 0 | 724 | 170 | 0.58 | 2.4 | 0.07 | 31 | ***8.5*** | 1.24 | 0.04 |
| Feb-87 | 0 | 0 | 701 | 164 | 0.56 | 3.2 | 0.11 | 46 | ***9.0*** | 1.28 | 0.04 |
| Mar-87 | 0 | 0 | 321 | 62 | 0.19 | 4.5 | 0.16 | 35 | 4.5 | 1.30 | 0.04 |
| Apr-87 | 0 | 0 | 248 | 43 | 0.12 | 4.3 | 0.15 | 34 | 3.2 | 1.31 | 0.04 |
| ***May-87*** | 414 | 0 | 294 | 55 | 0.17 | 3.1 | 0.10 | 34 | 3.7 | 1.31 | 0.04 |
| ***Jun-87*** | 517 | 0 | 272 | 49 | 0.15 | 2.4 | 0.07 | 26 | 3.1 | 1.31 | 0.04 |
| ***Jul-87*** | 54 | 5 | 316 | 61 | 0.19 | 2.2 | 0.06 | 26 | 3.7 | 1.31 | 0.04 |
| Aug-87 | 0 | 0 | 454 | 98 | 0.32 | 2.2 | 0.06 | 31 | 5.4 | 1.33 | 0.04 |
| Sep-87 | 0 | 0 | 528 | 118 | 0.39 | 2.2 | 0.06 | 34 | 6.2 | 1.36 | 0.04 |
| Oct-87 | 0 | 0 | 725 | 170 | 0.58 | 2.2 | 0.06 | 42 | ***8.3*** | 1.36 | 0.04 |
| Nov-87 | 0 | 0 | 700 | 164 | 0.56 | 2.2 | 0.06 | 35 | ***8.0*** | 1.32 | 0.04 |
| Dec-87 | 0 | 0 | 803 | 191 | 0.66 | 2.8 | 0.09 | 43 | ***8.7*** | 1.29 | 0.04 |
| Jan-88 | 0 | 0 | 650 | 150 | 0.51 | 4.7 | 0.17 | 45 | ***8.1*** | 1.31 | 0.04 |
| ***Feb-88*** | 139 | 0 | 333 | 65 | 0.21 | 4.7 | 0.17 | 33 | 4.7 | 1.32 | 0.04 |
| Mar-88 | 0 | 0 | 293 | 55 | 0.17 | 3.2 | 0.10 | 28 | 3.7 | 1.32 | 0.04 |
| Apr-88 | 0 | 0 | 305 | 58 | 0.18 | 2.9 | 0.09 | 30 | 3.8 | 1.32 | 0.04 |
| May-88 | 0 | 0 | 340 | 67 | 0.21 | 3.3 | 0.11 | 38 | 4.5 | 1.32 | 0.04 |
| Jun-88 | 0 | 0 | 380 | 78 | 0.25 | 3.0 | 0.09 | 38 | 4.9 | 1.32 | 0.04 |
| Jul-88 | 0 | 0 | 387 | 80 | 0.26 | 2.7 | 0.08 | 35 | 4.9 | 1.32 | 0.04 |
| Aug-88 | 0 | 0 | 526 | 117 | 0.39 | 2.7 | 0.08 | 43 | 6.6 | 1.29 | 0.04 |
| Sep-88 | 0 | 0 | 681 | 159 | 0.54 | 2.5 | 0.07 | 47 | ***8.1*** | 1.25 | 0.04 |
| Oct-88 | 0 | 0 | 818 | 195 | 0.67 | 2.3 | 0.07 | 49 | ***9.4*** | 1.21 | 0.04 |
| Nov-88 | 0 | 0 | 865 | 208 | 0.72 | 2.3 | 0.07 | 45 | ***9.8*** | 1.22 | 0.04 |
| Dec-88 | 0 | 0 | 829 | 198 | 0.68 | 2.2 | 0.06 | 36 | ***9.3*** | 1.24 | 0.04 |
| Jan-89 | 0 | 0 | 779 | 185 | 0.64 | 2.4 | 0.07 | 32 | ***9.0*** | 1.26 | 0.04 |
| Feb-89 | 0 | 0 | 570 | 129 | 0.43 | 2.7 | 0.08 | 33 | 7.1 | 1.27 | 0.04 |
| Mar-89 | 0 | 0 | 355 | 71 | 0.23 | 4.3 | 0.15 | 36 | 4.9 | 1.29 | 0.04 |
| Apr-89 | 0 | 0 | 233 | 38 | 0.11 | 5.1 | 0.19 | 38 | 3.0 | 1.30 | 0.04 |
| May-89 | 0 | 0 | 244 | 41 | 0.12 | 4.1 | 0.14 | 35 | 3.0 | 1.31 | 0.04 |
| ***Jun-89*** | 60 | 0 | 251 | 43 | 0.13 | 2.6 | 0.08 | 27 | 2.9 | 1.31 | 0.04 |
| ***Jul-89*** | 105 | 0 | 377 | 77 | 0.25 | 2.4 | 0.07 | 30 | 4.5 | 1.31 | 0.04 |
| Aug-89 | 0 | 0 | 428 | 91 | 0.30 | 2.2 | 0.06 | 31 | 5.1 | 1.36 | 0.04 |
| Sep-89 | 0 | 0 | 583 | 132 | 0.45 | 2.1 | 0.06 | 36 | 6.7 | 1.43 | 0.04 |
| Oct-89 | 0 | 0 | 709 | 166 | 0.57 | 2.1 | 0.06 | 39 | ***8.0*** | 1.45 | 0.04 |
| Nov-89 | 0 | 0 | 648 | 150 | 0.51 | 2.3 | 0.06 | 34 | 7.5 | 1.47 | 0.04 |
| Dec-89 | 0 | 0 | 674 | 157 | 0.53 | 2.4 | 0.07 | 32 | 8.0 | 1.48 | 0.04 |
| Jan-90 | 0 | 0 | 827 | 198 | 0.68 | 3.3 | 0.11 | 47 | ***10.5*** | 1.48 | 0.04 |
| Feb-90 | 0 | 0 | 584 | 133 | 0.45 | 4.1 | 0.14 | 42 | 7.9 | 1.48 | 0.04 |
| Mar-90 | 0 | 0 | 321 | 62 | 0.19 | 3.5 | 0.12 | 32 | 4.3 | 1.48 | 0.04 |
| Apr-90 | 0 | 0 | 321 | 62 | 0.19 | 3.4 | 0.11 | 36 | 4.3 | 1.49 | 0.04 |
| May-90 | 0 | 0 | 350 | 70 | 0.22 | 3.9 | 0.13 | 46 | 4.9 | 1.49 | 0.04 |
| Jun-90 | 0 | 0 | 376 | 77 | 0.25 | 2.9 | 0.09 | 37 | 4.8 | 1.50 | 0.04 |
| Jul-90 | 0 | 0 | 426 | 90 | 0.30 | 2.8 | 0.09 | 39 | 5.4 | 1.49 | 0.04 |
| Aug-90 | 0 | 0 | 570 | 129 | 0.43 | 2.9 | 0.09 | 49 | 7.2 | 1.50 | 0.04 |
| Sep-90 | 0 | 0 | 651 | 151 | 0.51 | 2.5 | 0.08 | 47 | 7.9 | 1.49 | 0.04 |
| Oct-90 | 0 | 0 | 933 | ***226*** | 0.78 | 2.4 | 0.07 | 57 | ***10.5*** | 1.48 | 0.04 |
| Nov-90 | 0 | 0 | 738 | 174 | 0.60 | 2.3 | 0.07 | 39 | ***8.5*** | 1.53 | 0.04 |
| Dec-90 | 0 | 0 | 629 | 145 | 0.49 | 2.3 | 0.07 | 29 | 7.4 | 1.58 | 0.04 |
| Jan-91 | 0 | 0 | 871 | 210 | 0.72 | 2.8 | 0.09 | 43 | ***10.4*** | 1.59 | 0.04 |
| Feb-91 | 0 | 0 | 853 | 205 | 0.71 | 2.9 | 0.09 | 50 | ***10.4*** | 1.61 | 0.04 |
| Mar-91 | 0 | 0 | 468 | 101 | 0.34 | 4.2 | 0.15 | 41 | 6.5 | 1.67 | 0.04 |
| Apr-91 | 0 | 0 | 268 | 48 | 0.14 | 4.9 | 0.18 | 40 | 3.6 | 1.70 | 0.04 |
| May-91 | 0 | 0 | 296 | 55 | 0.17 | 3.7 | 0.13 | 40 | 4.0 | 1.72 | 0.04 |
| Jun-91 | 0 | 0 | 361 | 73 | 0.23 | 2.9 | 0.09 | 36 | 4.6 | 1.71 | 0.04 |
| Jul-91 | 0 | 0 | 411 | 86 | 0.28 | 2.8 | 0.09 | 38 | 5.2 | 1.70 | 0.04 |
| Aug-91 | 0 | 0 | 584 | 132 | 0.45 | 2.9 | 0.09 | 50 | 7.4 | 1.74 | 0.04 |
| Sep-91 | 0 | 0 | 701 | 164 | 0.56 | 2.6 | 0.08 | 50 | ***8.4*** | 1.76 | 0.04 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-6 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 538 | 103 | 0.34 | 2.2 | 0.06 | 29 | 5.6 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 403 | 66 | 0.21 | 2.5 | 0.07 | 23 | 4.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 647 | 133 | 0.45 | 2.9 | 0.09 | 34 | 7.4 | n/a | n/a |
| Jan-76 | 0 | 0 | 668 | 139 | 0.46 | 3.1 | 0.10 | 34 | 7.9 | n/a | n/a |
| Feb-76 | 0 | 0 | 681 | 142 | 0.47 | 3.1 | 0.10 | 40 | ***8.0*** | n/a | n/a |
| Mar-76 | 0 | 0 | 476 | 86 | 0.27 | 3.0 | 0.09 | 31 | 5.3 | n/a | n/a |
| Apr-76 | 0 | 0 | 408 | 68 | 0.19 | 3.2 | 0.10 | 33 | 4.4 | n/a | n/a |
| May-76 | 0 | 0 | 406 | 67 | 0.21 | 3.1 | 0.10 | 36 | 4.4 | n/a | n/a |
| Jun-76 | 0 | 0 | 404 | 66 | 0.21 | 2.9 | 0.09 | 34 | 4.3 | n/a | n/a |
| Jul-76 | 0 | 0 | 425 | 72 | 0.23 | 2.7 | 0.08 | 34 | 4.5 | n/a | n/a |
| Aug-76 | 0 | 0 | 546 | 105 | 0.34 | 2.7 | 0.08 | 39 | 6.0 | n/a | n/a |
| Sep-76 | 0 | 0 | 535 | 102 | 0.36 | 2.5 | 0.07 | 37 | 5.8 | n/a | n/a |
| Oct-76 | 0 | 0 | 743 | 159 | 0.57 | 2.7 | 0.08 | 49 | ***8.3*** | n/a | n/a |
| Nov-76 | 0 | 0 | 714 | 151 | 0.51 | 2.8 | 0.09 | 42 | ***8.2*** | n/a | n/a |
| Dec-76 | 0 | 0 | 545 | 105 | 0.33 | 2.8 | 0.09 | 28 | 6.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 747 | 160 | 0.58 | 2.9 | 0.09 | 37 | ***8.6*** | n/a | n/a |
| Feb-77 | 0 | 0 | 799 | 175 | 0.61 | 3.6 | 0.12 | 55 | ***9.8*** | n/a | n/a |
| Mar-77 | 0 | 0 | 728 | 155 | 0.73 | 4.1 | 0.14 | ***68*** | ***9.0*** | n/a | n/a |
| Apr-77 | 0 | 0 | 520 | 98 | 0.45 | 3.6 | 0.12 | 56 | 6.3 | n/a | n/a |
| May-77 | 0 | 0 | 509 | 95 | 0.34 | 3.3 | 0.11 | 47 | 5.9 | n/a | n/a |
| Jun-77 | 0 | 0 | 573 | 113 | 0.37 | 3.3 | 0.11 | 51 | 6.8 | n/a | n/a |
| Jul-77 | 0 | 0 | 540 | 104 | 0.35 | 3.3 | 0.11 | 49 | 6.4 | n/a | n/a |
| Aug-77 | 0 | 0 | 461 | 82 | 0.26 | 3.2 | 0.10 | 42 | 5.2 | n/a | n/a |
| Sep-77 | 0 | 0 | 651 | 134 | 0.48 | 2.9 | 0.09 | 51 | 7.5 | n/a | n/a |
| Oct-77 | 0 | 0 | 842 | 186 | 0.68 | 2.8 | 0.09 | 61 | ***9.6*** | n/a | n/a |
| Nov-77 | 0 | 0 | 783 | 170 | 0.57 | 2.8 | 0.09 | 46 | ***8.9*** | n/a | n/a |
| Dec-77 | 0 | 0 | 883 | 197 | 0.65 | 2.9 | 0.09 | 45 | ***10.1*** | n/a | n/a |
| Jan-78 | 0 | 0 | 546 | 105 | 0.25 | 5.6 | 0.21 | 42 | 7.3 | n/a | n/a |
| Feb-78 | 0 | 0 | 355 | 53 | 0.15 | 7.2 | 0.28 | 44 | 4.5 | n/a | n/a |
| Mar-78 | 0 | 0 | 353 | 52 | 0.16 | 6.8 | 0.26 | 47 | 4.4 | n/a | n/a |
| Apr-78 | 0 | 0 | 309 | 41 | 0.11 | 4.4 | 0.16 | 34 | 3.0 | n/a | n/a |
| May-78 | 0 | 0 | 228 | 18 | 0.04 | 3.6 | 0.12 | 31 | 1.3 | n/a | n/a |
| Jun-78 | 0 | 0 | 235 | 20 | 0.04 | 3.4 | 0.11 | 30 | 1.4 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 282 | 33 | 0.09 | 3.7 | 0.13 | 36 | 2.5 | n/a | n/a |
| Aug-78 | 0 | 0 | 334 | 47 | 0.14 | 2.8 | 0.09 | 30 | 3.2 | n/a | n/a |
| Sep-78 | 0 | 0 | 535 | 102 | 0.34 | 2.4 | 0.07 | 35 | 5.7 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 593 | 118 | 0.43 | 2.4 | 0.07 | 38 | 6.4 | n/a | n/a |
| Nov-78 | 0 | 0 | 565 | 111 | 0.39 | 2.5 | 0.07 | 32 | 6.2 | n/a | n/a |
| Dec-78 | 0 | 0 | 728 | 155 | 0.54 | 2.4 | 0.07 | 32 | 7.9 | n/a | n/a |
| Jan-79 | 0 | 0 | 615 | 124 | 0.41 | 3.4 | 0.11 | 35 | 7.4 | n/a | n/a |
| Feb-79 | 0 | 0 | 390 | 63 | 0.18 | 5.0 | 0.18 | 34 | 4.6 | n/a | n/a |
| Mar-79 | 0 | 0 | 296 | 37 | 0.09 | 5.0 | 0.18 | 32 | 2.9 | n/a | n/a |
| Apr-79 | 0 | 0 | 281 | 33 | 0.09 | 3.5 | 0.12 | 31 | 2.4 | n/a | n/a |
| May-79 | 0 | 0 | 276 | 31 | 0.08 | 3.2 | 0.10 | 30 | 2.3 | n/a | n/a |
| ***Jun-79*** | 350 | 0 | 275 | 31 | 0.08 | 3.0 | 0.10 | 29 | 2.2 | n/a | n/a |
| ***Jul-79*** | 1415 | 1558 | 286 | 34 | 0.10 | 3.3 | 0.11 | 32 | 2.5 | n/a | n/a |
| Aug-79 | 0 | 0 | 369 | 57 | 0.17 | 2.6 | 0.08 | 29 | 3.6 | n/a | n/a |
| Sep-79 | 0 | 0 | 576 | 114 | 0.38 | 2.4 | 0.07 | 37 | 6.2 | n/a | n/a |
| Oct-79 | 0 | 0 | 749 | 161 | 0.56 | 2.4 | 0.07 | 44 | ***8.1*** | n/a | n/a |
| Nov-79 | 0 | 0 | 595 | 119 | 0.39 | 2.4 | 0.07 | 30 | 6.4 | n/a | n/a |
| Dec-79 | 0 | 0 | 547 | 106 | 0.28 | 2.6 | 0.08 | 25 | 6.0 | n/a | n/a |
| Jan-80 | 0 | 0 | 469 | 84 | 0.24 | 5.0 | 0.18 | 33 | 5.9 | n/a | n/a |
| Feb-80 | 0 | 0 | 308 | 40 | 0.11 | 6.2 | 0.23 | 35 | 3.4 | n/a | n/a |
| Mar-80 | 0 | 0 | 208 | 13 | 0.01 | 4.4 | 0.16 | 24 | 0.8 | n/a | n/a |
| Apr-80 | 0 | 0 | 270 | 30 | 0.07 | 3.6 | 0.12 | 30 | 2.2 | n/a | n/a |
| May-80 | 0 | 0 | 263 | 28 | 0.07 | 3.0 | 0.10 | 28 | 2.0 | n/a | n/a |
| Jun-80 | 0 | 0 | 264 | 28 | 0.07 | 3.1 | 0.10 | 29 | 2.0 | n/a | n/a |
| ***Jul-80*** | 1844 | 1601 | 282 | 33 | 0.09 | 3.8 | 0.13 | 38 | 2.5 | n/a | n/a |
| Aug-80 | 0 | 0 | 313 | 42 | 0.12 | 2.8 | 0.09 | 29 | 2.8 | n/a | n/a |
| Sep-80 | 0 | 0 | 474 | 86 | 0.28 | 2.4 | 0.07 | 32 | 5.0 | n/a | n/a |
| ***Oct-80*** | 49 | 0 | 545 | 105 | 0.37 | 2.5 | 0.07 | 35 | 5.9 | n/a | n/a |
| Nov-80 | 0 | 0 | 505 | 94 | 0.33 | 2.5 | 0.07 | 29 | 5.4 | n/a | n/a |
| Dec-80 | 0 | 0 | 612 | 123 | 0.45 | 2.5 | 0.07 | 29 | 6.7 | n/a | n/a |
| Jan-81 | 0 | 0 | 708 | 150 | 0.51 | 2.9 | 0.09 | 34 | ***8.1*** | n/a | n/a |
| Feb-81 | 0 | 0 | 442 | 77 | 0.22 | 3.3 | 0.11 | 29 | 5.0 | n/a | n/a |
| Mar-81 | 0 | 0 | 304 | 39 | 0.10 | 3.7 | 0.12 | 28 | 2.9 | n/a | n/a |

Table 2B-6 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 286 | 34 | 0.09 | 3.3 | 0.11 | 29 | 2.5 | n/a | n/a |
| ***May-81*** | 19 | 0 | 348 | 51 | 0.15 | 3.2 | 0.10 | 34 | 3.5 | n/a | n/a |
| ***Jun-81*** | 439 | 0 | 319 | 43 | 0.17 | 2.9 | 0.09 | 32 | 3.0 | n/a | n/a |
| ***Jul-81*** | 664 | 283 | 327 | 46 | 0.17 | 2.7 | 0.08 | 31 | 3.0 | n/a | n/a |
| Aug-81 | 0 | 0 | 492 | 91 | 0.26 | 2.4 | 0.07 | 31 | 5.2 | n/a | n/a |
| Sep-81 | 0 | 0 | 614 | 124 | 0.36 | 2.4 | 0.07 | 35 | 6.6 | n/a | n/a |
| Oct-81 | 0 | 0 | 765 | 165 | 0.51 | 2.4 | 0.07 | 42 | ***8.3*** | n/a | n/a |
| Nov-81 | 0 | 0 | 722 | 153 | 0.48 | 2.8 | 0.08 | 40 | ***8.2*** | n/a | n/a |
| Dec-81 | 0 | 0 | 350 | 52 | 0.12 | 4.7 | 0.17 | 28 | 3.9 | n/a | n/a |
| Jan-82 | 0 | 0 | 348 | 51 | 0.15 | 5.7 | 0.21 | 31 | 4.1 | n/a | n/a |
| Feb-82 | 0 | 0 | 319 | 43 | 0.12 | 5.7 | 0.21 | 34 | 3.5 | n/a | n/a |
| Mar-82 | 0 | 0 | 370 | 57 | 0.16 | 5.4 | 0.20 | 39 | 4.4 | n/a | n/a |
| Apr-82 | 0 | 0 | 208 | 13 | 0.01 | 4.3 | 0.15 | 28 | 0.8 | n/a | n/a |
| May-82 | 0 | 0 | 195 | 10 | 0.01 | 3.9 | 0.13 | 31 | 0.3 | n/a | n/a |
| Jun-82 | 0 | 0 | 233 | 20 | 0.04 | 3.2 | 0.10 | 28 | 1.4 | n/a | n/a |
| ***Jul-82*** | 1836 | 1613 | 276 | 32 | 0.08 | 3.8 | 0.13 | 36 | 2.4 | n/a | n/a |
| Aug-82 | 0 | 0 | 341 | 49 | 0.15 | 2.8 | 0.09 | 30 | 3.3 | n/a | n/a |
| Sep-82 | 0 | 0 | 405 | 89 | 0.29 | 2.3 | 0.07 | 31 | 5.0 | n/a | n/a |
| Oct-82 | 0 | 0 | 300 | 38 | 0.11 | 2.6 | 0.08 | 24 | 2.6 | n/a | n/a |
| Nov-82 | 0 | 0 | 243 | 23 | 0.05 | 3.2 | 0.11 | 23 | 1.6 | n/a | n/a |
| Dec-82 | 0 | 0 | 259 | 27 | 0.07 | 3.9 | 0.14 | 24 | 2.1 | n/a | n/a |
| Jan-83 | 0 | 0 | 229 | 19 | 0.04 | 4.1 | 0.14 | 19 | 1.3 | n/a | n/a |
| Feb-83 | 0 | 0 | 126 | 10 | 0.01 | 4.8 | 0.17 | 24 | 0.5 | n/a | n/a |
| Mar-83 | 0 | 0 | 162 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | n/a | n/a |
| Apr-83 | 0 | 0 | 221 | 17 | 0.03 | 5.3 | 0.20 | 34 | 1.2 | n/a | n/a |
| May-83 | 0 | 0 | 236 | 21 | 0.04 | 5.2 | 0.19 | 37 | 1.6 | n/a | n/a |
| Jun-83 | 0 | 0 | 151 | 10 | 0.01 | 3.7 | 0.13 | 30 | 0.5 | n/a | n/a |
| Jul-83 | 0 | 0 | 186 | 10 | 0.01 | 3.3 | 0.11 | 28 | 0.5 | n/a | n/a |
| Aug-83 | 0 | 0 | 260 | 27 | 0.07 | 2.6 | 0.08 | 24 | 1.8 | n/a | n/a |
| Sep-83 | 0 | 0 | 327 | 46 | 0.14 | 2.5 | 0.07 | 25 | 2.9 | n/a | n/a |
| Oct-83 | 0 | 0 | 254 | 26 | 0.06 | 2.9 | 0.09 | 25 | 1.8 | n/a | n/a |
| Nov-83 | 0 | 0 | 218 | 16 | 0.02 | 3.4 | 0.11 | 23 | 1.0 | n/a | n/a |
| Dec-83 | 0 | 0 | 139 | 10 | 0.01 | 3.9 | 0.13 | 22 | 0.5 | n/a | n/a |
| Jan-84 | 0 | 0 | 194 | 10 | 0.01 | 4.5 | 0.16 | 19 | 0.3 | n/a | n/a |
| Feb-84 | 0 | 0 | 265 | 29 | 0.06 | 3.9 | 0.13 | 25 | 2.2 | n/a | n/a |
| Mar-84 | 0 | 0 | 276 | 31 | 0.07 | 3.0 | 0.10 | 22 | 2.2 | n/a | n/a |
| ***Apr-84*** | 188 | 0 | 284 | 34 | 0.09 | 2.6 | 0.08 | 23 | 2.3 | n/a | n/a |
| May-84 | 0 | 0 | 326 | 45 | 0.13 | 2.7 | 0.08 | 28 | 3.0 | n/a | n/a |
| ***Jun-84*** | 731 | 0 | 311 | 41 | 0.13 | 2.8 | 0.09 | 30 | 2.8 | n/a | n/a |
| ***Jul-84*** | 873 | 1535 | 265 | 29 | 0.09 | 3.1 | 0.10 | 30 | 2.1 | n/a | n/a |
| Aug-84 | 0 | 0 | 293 | 36 | 0.13 | 2.5 | 0.07 | 26 | 2.4 | n/a | n/a |
| Sep-84 | 0 | 0 | 477 | 86 | 0.31 | 2.4 | 0.07 | 33 | 5.0 | n/a | n/a |
| Oct-84 | 0 | 0 | 621 | 126 | 0.45 | 2.4 | 0.07 | 38 | 6.7 | n/a | n/a |
| Nov-84 | 0 | 0 | 630 | 128 | 0.49 | 2.7 | 0.08 | 39 | 7.1 | n/a | n/a |
| Dec-84 | 0 | 0 | 377 | 59 | 0.17 | 3.6 | 0.12 | 27 | 4.1 | n/a | n/a |
| ***Jan-85*** | 399 | 0 | 371 | 58 | 0.16 | 3.8 | 0.13 | 26 | 4.1 | n/a | n/a |
| ***Feb-85*** | 61 | 0 | 433 | 74 | 0.22 | 3.6 | 0.12 | 31 | 5.0 | n/a | n/a |
| Mar-85 | 0 | 0 | 375 | 58 | 0.17 | 3.6 | 0.12 | 32 | 4.1 | n/a | n/a |
| Apr-85 | 0 | 0 | 361 | 55 | 0.16 | 3.6 | 0.12 | 37 | 3.9 | n/a | n/a |
| May-85 | 0 | 0 | 367 | 56 | 0.18 | 3.2 | 0.10 | 35 | 3.8 | n/a | n/a |
| Jun-85 | 0 | 0 | 303 | 39 | 0.11 | 2.7 | 0.08 | 28 | 2.6 | n/a | n/a |
| ***Jul-85*** | 38 | 0 | 371 | 57 | 0.16 | 2.4 | 0.07 | 28 | 3.6 | n/a | n/a |
| Aug-85 | 0 | 0 | 550 | 106 | 0.34 | 2.3 | 0.07 | 34 | 5.8 | n/a | n/a |
| Sep-85 | 0 | 0 | 542 | 104 | 0.34 | 2.3 | 0.07 | 33 | 5.7 | n/a | n/a |
| Oct-85 | 0 | 0 | 683 | 143 | 0.49 | 2.5 | 0.07 | 41 | 7.5 | n/a | n/a |
| Nov-85 | 0 | 0 | 662 | 137 | 0.49 | 2.6 | 0.08 | 38 | 7.4 | n/a | n/a |
| Dec-85 | 0 | 0 | 599 | 120 | 0.41 | 3.2 | 0.11 | 36 | 7.1 | n/a | n/a |
| Jan-86 | 0 | 0 | 585 | 110 | 0.36 | 4.6 | 0.17 | 36 | 7.1 | n/a | n/a |
| Feb-86 | 0 | 0 | 389 | 62 | 0.18 | 8.2 | 0.32 | 51 | 5.4 | n/a | n/a |
| Mar-86 | 0 | 0 | 192 | 10 | 0.01 | 5.3 | 0.19 | 29 | 0.5 | n/a | n/a |
| Apr-86 | 0 | 0 | 234 | 20 | 0.04 | 4.2 | 0.15 | 29 | 1.5 | n/a | n/a |
| ***May-86*** | 290 | 0 | 252 | 25 | 0.06 | 3.6 | 0.12 | 32 | 1.9 | n/a | n/a |
| Jun-86 | 0 | 0 | 265 | 28 | 0.07 | 3.2 | 0.11 | 30 | 2.1 | n/a | n/a |
| ***Jul-86*** | 1837 | 1535 | 302 | 39 | 0.12 | 4.7 | 0.17 | 40 | 3.0 | n/a | n/a |
| Aug-86 | 0 | 0 | 335 | 48 | 0.14 | 3.2 | 0.10 | 34 | 3.3 | n/a | n/a |
| Sep-86 | 0 | 0 | 445 | 78 | 0.27 | 2.5 | 0.08 | 33 | 4.7 | n/a | n/a |

Table 2B-6 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 480 | 87 | 0.42 | 2.3 | 0.07 | 36 | 5.0 | n/a | n/a |
| Nov-86 | 0 | 0 | 510 | 96 | 0.38 | 2.5 | 0.07 | 31 | 5.5 | n/a | n/a |
| Dec-86 | 0 | 0 | 670 | 139 | 0.51 | 2.5 | 0.07 | 32 | 7.4 | n/a | n/a |
| Jan-87 | 0 | 0 | 671 | 139 | 0.48 | 2.8 | 0.09 | 32 | 7.7 | n/a | n/a |
| Feb-87 | 0 | 0 | 694 | 146 | 0.42 | 3.6 | 0.12 | 42 | 8.6 | n/a | n/a |
| Mar-87 | 0 | 0 | 395 | 64 | 0.17 | 5.0 | 0.18 | 36 | 4.7 | n/a | n/a |
| Apr-87 | 0 | 0 | 311 | 41 | 0.11 | 5.0 | 0.18 | 38 | 3.2 | n/a | n/a |
| ***May-87*** | 414 | 0 | 367 | 56 | 0.17 | 3.7 | 0.12 | 40 | 4.0 | n/a | n/a |
| ***Jun-87*** | 517 | 0 | 322 | 44 | 0.18 | 2.9 | 0.09 | 33 | 3.0 | n/a | n/a |
| ***Jul-87*** | 54 | 5 | 322 | 44 | 0.23 | 2.5 | 0.08 | 31 | 2.9 | n/a | n/a |
| Aug-87 | 0 | 0 | 433 | 74 | 0.33 | 2.5 | 0.07 | 36 | 4.5 | n/a | n/a |
| Sep-87 | 0 | 0 | 500 | 93 | 0.35 | 2.5 | 0.08 | 37 | 5.4 | n/a | n/a |
| Oct-87 | 0 | 0 | 697 | 147 | 0.53 | 2.6 | 0.08 | 45 | 7.7 | n/a | n/a |
| Nov-87 | 0 | 0 | 664 | 137 | 0.47 | 2.6 | 0.08 | 37 | 7.4 | n/a | n/a |
| Dec-87 | 0 | 0 | 726 | 154 | 0.55 | 3.0 | 0.09 | 40 | ***8.4*** | n/a | n/a |
| Jan-88 | 0 | 0 | 635 | 130 | 0.44 | 4.8 | 0.18 | 42 | ***8.2*** | n/a | n/a |
| ***Feb-88*** | 139 | 0 | 391 | 63 | 0.18 | 5.6 | 0.21 | 37 | 4.8 | n/a | n/a |
| Mar-88 | 0 | 0 | 369 | 57 | 0.15 | 4.4 | 0.16 | 31 | 4.1 | n/a | n/a |
| Apr-88 | 0 | 0 | 373 | 58 | 0.16 | 3.8 | 0.13 | 38 | 4.1 | n/a | n/a |
| May-88 | 0 | 0 | 421 | 71 | 0.21 | 4.1 | 0.14 | 41 | 4.8 | n/a | n/a |
| Jun-88 | 0 | 0 | 443 | 77 | 0.23 | 3.8 | 0.13 | 47 | 5.3 | n/a | n/a |
| Jul-88 | 0 | 0 | 416 | 70 | 0.23 | 3.4 | 0.11 | 41 | 4.7 | n/a | n/a |
| Aug-88 | 0 | 0 | 506 | 94 | 0.32 | 3.4 | 0.11 | 47 | 6.0 | n/a | n/a |
| Sep-88 | 0 | 0 | 617 | 125 | 0.43 | 2.9 | 0.09 | 48 | 7.1 | n/a | n/a |
| Oct-88 | 0 | 0 | 768 | 166 | 0.58 | 2.7 | 0.08 | 52 | ***8.7*** | n/a | n/a |
| Nov-88 | 0 | 0 | 782 | 170 | 0.59 | 2.7 | 0.08 | 45 | ***8.8*** | n/a | n/a |
| Dec-88 | 0 | 0 | 758 | 163 | 0.54 | 2.6 | 0.08 | 35 | ***8.4*** | n/a | n/a |
| Jan-89 | 0 | 0 | 748 | 160 | 0.54 | 2.8 | 0.09 | 33 | ***8.5*** | n/a | n/a |
| Feb-89 | 0 | 0 | 610 | 123 | 0.40 | 3.4 | 0.11 | 39 | 7.4 | n/a | n/a |
| Mar-89 | 0 | 0 | 397 | 65 | 0.20 | 4.6 | 0.17 | 36 | 4.6 | n/a | n/a |
| Apr-89 | 0 | 0 | 259 | 27 | 0.06 | 5.4 | 0.20 | 37 | 2.2 | n/a | n/a |
| May-89 | 0 | 0 | 312 | 41 | 0.12 | 4.7 | 0.17 | 39 | 3.2 | n/a | n/a |
| ***Jun-89*** | 60 | 0 | 265 | 34 | 0.09 | 3.1 | 0.10 | 30 | 2.4 | n/a | n/a |
| ***Jul-89*** | 105 | 0 | 370 | 57 | 0.19 | 2.8 | 0.09 | 33 | 3.7 | n/a | n/a |
| Aug-89 | 0 | 0 | 410 | 68 | 0.24 | 2.5 | 0.07 | 32 | 4.2 | n/a | n/a |
| Sep-89 | 0 | 0 | 535 | 102 | 0.37 | 2.4 | 0.07 | 36 | 5.7 | n/a | n/a |
| Oct-89 | 0 | 0 | 673 | 140 | 0.53 | 2.4 | 0.07 | 43 | 7.3 | n/a | n/a |
| Nov-89 | 0 | 0 | 636 | 130 | 0.45 | 2.6 | 0.08 | 36 | 7.1 | n/a | n/a |
| Dec-89 | 0 | 0 | 628 | 127 | 0.43 | 2.8 | 0.09 | 33 | 7.1 | n/a | n/a |
| Jan-90 | 0 | 0 | 739 | 158 | 0.57 | 3.5 | 0.12 | 43 | ***9.0*** | n/a | n/a |
| Feb-90 | 0 | 0 | 626 | 127 | 0.41 | 4.6 | 0.17 | 45 | 8.0 | n/a | n/a |
| Mar-90 | 0 | 0 | 389 | 62 | 0.18 | 4.4 | 0.16 | 33 | 4.4 | n/a | n/a |
| Apr-90 | 0 | 0 | 406 | 67 | 0.20 | 4.3 | 0.15 | 39 | 4.7 | n/a | n/a |
| May-90 | 0 | 0 | 418 | 70 | 0.22 | 4.5 | 0.16 | 44 | 4.9 | n/a | n/a |
| Jun-90 | 0 | 0 | 420 | 71 | 0.23 | 3.6 | 0.12 | 44 | 4.8 | n/a | n/a |
| Jul-90 | 0 | 0 | 445 | 78 | 0.25 | 3.6 | 0.12 | 45 | 5.2 | n/a | n/a |
| Aug-90 | 0 | 0 | 537 | 103 | 0.34 | 3.6 | 0.12 | 52 | 6.5 | n/a | n/a |
| Sep-90 | 0 | 0 | 598 | 119 | 0.42 | 3.1 | 0.10 | 49 | 7.0 | n/a | n/a |
| Oct-90 | 0 | 0 | 824 | 181 | 0.67 | 2.8 | 0.09 | 59 | ***9.4*** | n/a | n/a |
| Nov-90 | 0 | 0 | 739 | 158 | 0.55 | 2.8 | 0.09 | 44 | ***8.4*** | n/a | n/a |
| Dec-90 | 0 | 0 | 602 | 121 | 0.40 | 2.7 | 0.08 | 30 | 6.8 | n/a | n/a |
| Jan-91 | 0 | 0 | 744 | 159 | 0.45 | 3.4 | 0.11 | 36 | ***9.0*** | n/a | n/a |
| Feb-91 | 0 | 0 | 796 | 174 | 0.45 | 3.9 | 0.13 | 47 | ***10.0*** | n/a | n/a |
| Mar-91 | 0 | 0 | 514 | 97 | 0.27 | 4.5 | 0.16 | 40 | 6.4 | n/a | n/a |
| Apr-91 | 0 | 0 | 329 | 46 | 0.13 | 5.6 | 0.21 | 43 | 3.7 | n/a | n/a |
| May-91 | 0 | 0 | 346 | 51 | 0.15 | 4.4 | 0.16 | 39 | 3.7 | n/a | n/a |
| Jun-91 | 0 | 0 | 410 | 68 | 0.21 | 3.7 | 0.12 | 44 | 4.7 | n/a | n/a |
| Jul-91 | 0 | 0 | 445 | 78 | 0.25 | 3.6 | 0.12 | 46 | 5.2 | n/a | n/a |
| Aug-91 | 0 | 0 | 535 | 102 | 0.34 | 3.7 | 0.13 | 53 | 6.5 | n/a | n/a |
| Sep-91 | 0 | 0 | 623 | 126 | 0.43 | 3.1 | 0.10 | 50 | 7.3 | n/a | n/a |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-7 Monthly Average Water Quality at
Banks Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 505 | 94 | 0.31 | 2.4 | 0.07 | 30 | 5.3 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 393 | 64 | 0.20 | 2.6 | 0.08 | 24 | 4.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 595 | 119 | 0.40 | 3.1 | 0.10 | 34 | 6.9 | n/a | n/a |
| Jan-76 | 0 | 0 | 616 | 124 | 0.42 | 3.3 | 0.11 | 34 | 7.4 | n/a | n/a |
| Feb-76 | 0 | 0 | 673 | 140 | 0.47 | 3.3 | 0.11 | 41 | ***8.0*** | n/a | n/a |
| Mar-76 | 0 | 0 | 590 | 117 | 0.39 | 3.1 | 0.10 | 40 | 6.9 | n/a | n/a |
| Apr-76 | 0 | 0 | 544 | 105 | 0.35 | 3.1 | 0.10 | 42 | 6.3 | n/a | n/a |
| May-76 | 0 | 0 | 443 | 77 | 0.25 | 3.2 | 0.10 | 40 | 5.0 | n/a | n/a |
| Jun-76 | 0 | 0 | 418 | 70 | 0.22 | 3.1 | 0.10 | 38 | 4.6 | n/a | n/a |
| Jul-76 | 0 | 0 | 409 | 68 | 0.22 | 3.0 | 0.10 | 36 | 4.4 | n/a | n/a |
| Aug-76 | 0 | 0 | 502 | 93 | 0.31 | 2.9 | 0.09 | 41 | 5.7 | n/a | n/a |
| Sep-76 | 0 | 0 | 515 | 97 | 0.32 | 2.7 | 0.08 | 38 | 5.7 | n/a | n/a |
| Oct-76 | 0 | 0 | 692 | 145 | 0.49 | 2.9 | 0.09 | 49 | 8.0 | n/a | n/a |
| Nov-76 | 0 | 0 | 657 | 136 | 0.46 | 3.1 | 0.10 | 44 | 7.7 | n/a | n/a |
| Dec-76 | 0 | 0 | 555 | 108 | 0.36 | 3.6 | 0.12 | 37 | 6.7 | n/a | n/a |
| Jan-77 | 0 | 0 | 686 | 143 | 0.49 | 3.4 | 0.12 | 39 | ***8.3*** | n/a | n/a |
| Feb-77 | 0 | 0 | 772 | 167 | 0.57 | 3.9 | 0.14 | 56 | ***9.7*** | n/a | n/a |
| Mar-77 | 0 | 0 | 976 | 223 | 0.77 | 3.1 | 0.10 | 64 | ***11.3*** | n/a | n/a |
| Apr-77 | 0 | 0 | 639 | 131 | 0.44 | 3.6 | 0.12 | 55 | 7.8 | n/a | n/a |
| May-77 | 0 | 0 | 541 | 104 | 0.34 | 3.4 | 0.11 | 49 | 6.5 | n/a | n/a |
| Jun-77 | 0 | 0 | 568 | 111 | 0.37 | 3.4 | 0.11 | 52 | 6.8 | n/a | n/a |
| Jul-77 | 0 | 0 | 536 | 102 | 0.34 | 3.6 | 0.12 | 52 | 6.5 | n/a | n/a |
| Aug-77 | 0 | 0 | 465 | 83 | 0.27 | 3.5 | 0.12 | 45 | 5.4 | n/a | n/a |
| Sep-77 | 0 | 0 | 596 | 119 | 0.40 | 3.2 | 0.10 | 50 | 7.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 786 | 171 | 0.58 | 3.0 | 0.10 | 57 | ***9.2*** | n/a | n/a |
| Nov-77 | 0 | 0 | 749 | 161 | 0.55 | 3.0 | 0.10 | 47 | ***8.7*** | n/a | n/a |
| Dec-77 | 0 | 0 | 775 | 168 | 0.57 | 3.0 | 0.09 | 41 | ***9.0*** | n/a | n/a |
| Jan-78 | 0 | 0 | 536 | 102 | 0.34 | 6.3 | 0.24 | 46 | 7.4 | n/a | n/a |
| Feb-78 | 0 | 0 | 315 | 42 | 0.12 | 9.4 | 0.38 | 51 | 4.0 | n/a | n/a |
| Mar-78 | 0 | 0 | 336 | 48 | 0.14 | 5.3 | 0.20 | 37 | 3.7 | n/a | n/a |
| Apr-78 | 0 | 0 | 252 | 25 | 0.06 | 4.0 | 0.14 | 29 | 1.9 | n/a | n/a |
| May-78 | 0 | 0 | 229 | 19 | 0.04 | 3.8 | 0.13 | 32 | 1.4 | n/a | n/a |
| Jun-78 | 0 | 0 | 238 | 21 | 0.05 | 3.5 | 0.12 | 31 | 1.5 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 309 | 41 | 0.12 | 4.1 | 0.15 | 36 | 3.0 | n/a | n/a |
| Aug-78 | 0 | 0 | 351 | 52 | 0.16 | 3.0 | 0.10 | 33 | 3.5 | n/a | n/a |
| Sep-78 | 0 | 0 | 506 | 94 | 0.31 | 2.6 | 0.08 | 36 | 5.5 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 544 | 105 | 0.35 | 2.7 | 0.08 | 37 | 6.0 | 21.48 | 0.97 |
| Nov-78 | 0 | 0 | 509 | 95 | 0.31 | 2.8 | 0.09 | 31 | 5.6 | 20.70 | 0.95 |
| Dec-78 | 0 | 0 | 656 | 135 | 0.46 | 2.7 | 0.08 | 33 | 7.4 | 20.43 | 0.93 |
| Jan-79 | 0 | 0 | 531 | 101 | 0.33 | 3.8 | 0.13 | 34 | 6.5 | 20.18 | 0.92 |
| Feb-79 | 0 | 0 | 349 | 52 | 0.16 | 5.2 | 0.19 | 33 | 4.0 | 20.85 | 0.95 |
| Mar-79 | 0 | 0 | 308 | 40 | 0.12 | 5.6 | 0.21 | 37 | 3.3 | 20.84 | 1.01 |
| Apr-79 | 0 | 0 | 311 | 41 | 0.12 | 3.9 | 0.14 | 36 | 3.1 | 20.74 | 1.06 |
| May-79 | 0 | 0 | 288 | 35 | 0.10 | 3.3 | 0.11 | 31 | 2.5 | 20.91 | 1.09 |
| ***Jun-79*** | 350 | 0 | 302 | 39 | 0.11 | 3.3 | 0.11 | 33 | 2.8 | 20.97 | 1.11 |
| ***Jul-79*** | 1415 | 1558 | 301 | 38 | 0.11 | 3.5 | 0.12 | 35 | 2.8 | 20.94 | 1.12 |
| Aug-79 | 0 | 0 | 370 | 57 | 0.18 | 2.8 | 0.09 | 32 | 3.7 | 21.20 | 1.15 |
| Sep-79 | 0 | 0 | 533 | 102 | 0.34 | 2.6 | 0.08 | 38 | 5.8 | 21.19 | 1.16 |
| Oct-79 | 0 | 0 | 688 | 144 | 0.49 | 2.6 | 0.08 | 44 | 7.7 | 21.97 | 1.18 |
| Nov-79 | 0 | 0 | 563 | 110 | 0.37 | 2.5 | 0.07 | 31 | 6.1 | 22.35 | 1.19 |
| Dec-79 | 0 | 0 | 523 | 99 | 0.33 | 2.8 | 0.09 | 28 | 5.8 | 22.74 | 1.19 |
| Jan-80 | 0 | 0 | 321 | 44 | 0.13 | 6.2 | 0.24 | 32 | 3.6 | 23.61 | 1.22 |
| Feb-80 | 0 | 0 | 162 | 10 | 0.01 | 4.2 | 0.15 | 21 | 0.5 | 23.91 | 1.33 |
| Mar-80 | 0 | 0 | 226 | 18 | 0.04 | 4.3 | 0.15 | 25 | 1.3 | 23.74 | 1.38 |
| Apr-80 | 0 | 0 | 261 | 33 | 0.09 | 3.5 | 0.12 | 31 | 2.4 | 23.43 | 1.42 |
| May-80 | 0 | 0 | 273 | 31 | 0.08 | 3.2 | 0.10 | 30 | 2.2 | 23.51 | 1.45 |
| Jun-80 | 0 | 0 | 276 | 31 | 0.08 | 3.3 | 0.11 | 31 | 2.3 | 23.73 | 1.48 |
| ***Jul-80*** | 1844 | 1601 | 302 | 39 | 0.11 | 4.2 | 0.15 | 35 | 2.9 | 23.81 | 1.50 |
| Aug-80 | 0 | 0 | 337 | 48 | 0.15 | 3.1 | 0.10 | 33 | 3.3 | 24.04 | 1.54 |
| Sep-80 | 0 | 0 | 457 | 81 | 0.26 | 2.6 | 0.08 | 34 | 4.9 | 24.12 | 1.55 |
| ***Oct-80*** | 49 | 0 | 507 | 95 | 0.31 | 2.7 | 0.08 | 35 | 5.6 | 24.76 | 1.57 |
| Nov-80 | 0 | 0 | 474 | 86 | 0.28 | 2.7 | 0.08 | 29 | 5.2 | 25.21 | 1.59 |
| Dec-80 | 0 | 0 | 578 | 114 | 0.38 | 2.7 | 0.08 | 29 | 6.5 | 25.49 | 1.60 |
| Jan-81 | 0 | 0 | 615 | 124 | 0.42 | 3.1 | 0.10 | 32 | 7.2 | 25.11 | 1.60 |
| Feb-81 | 0 | 0 | 523 | 99 | 0.33 | 3.4 | 0.11 | 35 | 6.2 | 25.47 | 1.53 |
| Mar-81 | 0 | 0 | 472 | 85 | 0.28 | 3.8 | 0.13 | 39 | 5.7 | 26.04 | 1.44 |

2B-19

Table 2B-7 Monthly Average Water Quality at
Banks Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 349 | 51 | 0.16 | 3.5 | 0.12 | 35 | 3.7 | 26.38 | 1.42 |
| ***May-81*** | 19 | 0 | 375 | 58 | 0.18 | 3.3 | 0.11 | 36 | 4.0 | 26.25 | 1.38 |
| ***Jun-81*** | 439 | 0 | 343 | 50 | 0.15 | 3.1 | 0.10 | 34 | 3.4 | 26.32 | 1.35 |
| ***Jul-81*** | 664 | 283 | 328 | 46 | 0.14 | 3.0 | 0.10 | 31 | 3.1 | 26.42 | 1.33 |
| Aug-81 | 0 | 0 | 455 | 80 | 0.26 | 2.6 | 0.08 | 34 | 4.8 | 26.56 | 1.32 |
| Sep-81 | 0 | 0 | 562 | 110 | 0.37 | 2.6 | 0.08 | 38 | 6.2 | 27.23 | 1.34 |
| Oct-81 | 0 | 0 | 715 | 152 | 0.52 | 2.7 | 0.08 | 46 | ***8.0*** | 26.50 | 1.32 |
| Nov-81 | 0 | 0 | 675 | 141 | 0.48 | 2.9 | 0.09 | 41 | 7.8 | 26.28 | 1.30 |
| Dec-81 | 0 | 0 | 396 | 64 | 0.20 | 4.5 | 0.16 | 30 | 4.6 | 27.55 | 1.32 |
| Jan-82 | 0 | 0 | 359 | 54 | 0.17 | 7.5 | 0.29 | 40 | 4.6 | 27.67 | 1.39 |
| Feb-82 | 0 | 0 | 262 | 28 | 0.07 | 5.6 | 0.21 | 30 | 2.3 | 26.85 | 1.46 |
| Mar-82 | 0 | 0 | 244 | 23 | 0.05 | 3.4 | 0.11 | 25 | 1.7 | 26.52 | 1.47 |
| Apr-82 | 0 | 0 | 154 | 10 | 0.01 | 4.1 | 0.14 | 26 | 0.5 | 26.35 | 1.45 |
| May-82 | 0 | 0 | 178 | 10 | 0.01 | 3.9 | 0.13 | 31 | 0.5 | 26.14 | 1.47 |
| Jun-82 | 0 | 0 | 242 | 22 | 0.05 | 3.3 | 0.11 | 30 | 1.6 | 26.01 | 1.50 |
| ***Jul-82*** | 1836 | 1613 | 296 | 37 | 0.10 | 4.1 | 0.14 | 34 | 2.7 | 26.06 | 1.53 |
| Aug-82 | 0 | 0 | 360 | 55 | 0.17 | 3.1 | 0.10 | 34 | 3.7 | 25.86 | 1.52 |
| Sep-82 | 0 | 0 | 468 | 84 | 0.27 | 2.5 | 0.07 | 33 | 4.9 | 26.09 | 1.53 |
| Oct-82 | 0 | 0 | 292 | 36 | 0.10 | 2.9 | 0.09 | 26 | 2.5 | 26.80 | 1.56 |
| Nov-82 | 0 | 0 | 252 | 25 | 0.06 | 3.3 | 0.11 | 24 | 1.8 | 26.38 | 1.59 |
| Dec-82 | 0 | 0 | 142 | 10 | 0.01 | 3.6 | 0.12 | 21 | 0.5 | 25.66 | 1.61 |
| Jan-83 | 0 | 0 | 149 | 10 | 0.01 | 3.9 | 0.13 | 20 | 0.5 | 24.26 | 1.62 |
| Feb-83 | 0 | 0 | 117 | 10 | 0.01 | 4.8 | 0.17 | 24 | 0.5 | 23.43 | 1.52 |
| Mar-83 | 0 | 0 | 157 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | 23.40 | 1.52 |
| Apr-83 | 0 | 0 | 187 | 10 | 0.01 | 5.2 | 0.19 | 32 | 0.5 | 23.30 | 1.52 |
| May-83 | 0 | 0 | 160 | 10 | 0.01 | 4.8 | 0.18 | 32 | 0.5 | 23.05 | 1.54 |
| Jun-83 | 0 | 0 | 151 | 10 | 0.01 | 3.7 | 0.13 | 31 | 0.5 | 22.83 | 1.55 |
| Jul-83 | 0 | 0 | 187 | 10 | 0.01 | 3.4 | 0.11 | 28 | 0.5 | 22.73 | 1.57 |
| Aug-83 | 0 | 0 | 274 | 31 | 0.08 | 2.7 | 0.08 | 26 | 2.1 | 22.44 | 1.58 |
| Sep-83 | 0 | 0 | 352 | 52 | 0.16 | 2.7 | 0.08 | 29 | 3.4 | 22.73 | 1.61 |
| Oct-83 | 0 | 0 | 266 | 29 | 0.08 | 3.1 | 0.10 | 27 | 2.1 | 22.36 | 1.61 |
| Nov-83 | 0 | 0 | 200 | 11 | 0.01 | 3.3 | 0.11 | 22 | 0.5 | 21.72 | 1.61 |
| Dec-83 | 0 | 0 | 125 | 10 | 0.01 | 3.8 | 0.13 | 22 | 0.5 | 21.23 | 1.62 |
| Jan-84 | 0 | 0 | 174 | 10 | 0.01 | 4.4 | 0.15 | 19 | 0.5 | 20.46 | 1.64 |
| Feb-84 | 0 | 0 | 268 | 29 | 0.08 | 3.6 | 0.12 | 24 | 2.2 | 18.06 | 1.63 |
| Mar-84 | 0 | 0 | 331 | 47 | 0.14 | 3.1 | 0.10 | 26 | 3.2 | 17.29 | 1.63 |
| ***Apr-84*** | 188 | 0 | 341 | 49 | 0.15 | 2.9 | 0.09 | 28 | 3.3 | 17.03 | 1.64 |
| May-84 | 0 | 0 | 347 | 51 | 0.15 | 2.8 | 0.09 | 30 | 3.4 | 17.16 | 1.64 |
| ***Jun-84*** | 731 | 0 | 344 | 50 | 0.15 | 3.2 | 0.10 | 34 | 3.5 | 17.14 | 1.64 |
| ***Jul-84*** | 873 | 1535 | 287 | 35 | 0.10 | 3.3 | 0.11 | 32 | 2.5 | 17.19 | 1.64 |
| Aug-84 | 0 | 0 | 315 | 42 | 0.12 | 2.7 | 0.08 | 28 | 2.8 | 17.05 | 1.65 |
| Sep-84 | 0 | 0 | 463 | 83 | 0.27 | 2.6 | 0.08 | 34 | 4.9 | 16.70 | 1.65 |
| Oct-84 | 0 | 0 | 593 | 118 | 0.40 | 2.6 | 0.08 | 38 | 6.5 | 16.73 | 1.66 |
| Nov-84 | 0 | 0 | 581 | 115 | 0.38 | 2.8 | 0.09 | 36 | 6.6 | 16.94 | 1.67 |
| Dec-84 | 0 | 0 | 408 | 68 | 0.21 | 3.7 | 0.13 | 30 | 4.7 | 17.10 | 1.66 |
| ***Jan-85*** | 399 | 0 | 420 | 71 | 0.23 | 4.0 | 0.14 | 26 | 4.8 | 17.03 | 1.66 |
| ***Feb-85*** | 61 | 0 | 505 | 94 | 0.31 | 3.8 | 0.13 | 38 | 6.2 | 16.78 | 1.56 |
| Mar-85 | 0 | 0 | 496 | 92 | 0.30 | 3.7 | 0.13 | 41 | 6.0 | 16.98 | 1.51 |
| Apr-85 | 0 | 0 | 469 | 84 | 0.27 | 3.8 | 0.13 | 45 | 5.7 | 16.93 | 1.47 |
| May-85 | 0 | 0 | 402 | 66 | 0.21 | 3.3 | 0.11 | 39 | 4.4 | 17.03 | 1.43 |
| Jun-85 | 0 | 0 | 330 | 46 | 0.14 | 3.0 | 0.09 | 31 | 3.2 | 17.09 | 1.38 |
| ***Jul-85*** | 38 | 0 | 354 | 53 | 0.16 | 2.6 | 0.08 | 28 | 3.4 | 17.16 | 1.36 |
| Aug-85 | 0 | 0 | 501 | 93 | 0.31 | 2.4 | 0.07 | 34 | 5.3 | 17.70 | 1.36 |
| Sep-85 | 0 | 0 | 512 | 96 | 0.32 | 2.5 | 0.07 | 34 | 5.5 | 18.58 | 1.36 |
| Oct-85 | 0 | 0 | 658 | 136 | 0.46 | 2.7 | 0.08 | 43 | 7.4 | 17.58 | 1.33 |
| Nov-85 | 0 | 0 | 640 | 131 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 17.82 | 1.29 |
| Dec-85 | 0 | 0 | 603 | 121 | 0.41 | 3.8 | 0.13 | 42 | 7.5 | 18.32 | 1.27 |
| Jan-86 | 0 | 0 | 551 | 107 | 0.35 | 5.0 | 0.18 | 38 | 7.1 | 19.63 | 1.27 |
| Feb-86 | 0 | 0 | 343 | 50 | 0.15 | 9.5 | 0.38 | 54 | 4.6 | 21.47 | 1.32 |
| Mar-86 | 0 | 0 | 184 | 10 | 0.01 | 4.5 | 0.16 | 25 | 0.5 | 22.22 | 1.43 |
| Apr-86 | 0 | 0 | 231 | 19 | 0.04 | 4.1 | 0.14 | 28 | 1.4 | 22.24 | 1.44 |
| ***May-86*** | 290 | 0 | 260 | 27 | 0.07 | 3.8 | 0.13 | 34 | 2.1 | 22.35 | 1.43 |
| Jun-86 | 0 | 0 | 273 | 31 | 0.08 | 3.3 | 0.11 | 33 | 2.2 | 22.54 | 1.42 |
| ***Jul-86*** | 1837 | 1535 | 319 | 43 | 0.13 | 5.3 | 0.19 | 45 | 3.4 | 22.69 | 1.41 |
| Aug-86 | 0 | 0 | 382 | 60 | 0.19 | 3.5 | 0.12 | 40 | 4.2 | 22.98 | 1.41 |
| Sep-86 | 0 | 0 | 452 | 80 | 0.26 | 2.8 | 0.09 | 35 | 4.9 | 22.52 | 1.37 |

Table 2B-7 Monthly Average Water Quality at
Banks Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 481 | 88 | 0.29 | 2.5 | 0.08 | 32 | 5.1 | 22.91 | 1.37 |
| Nov-86 | 0 | 0 | 495 | 92 | 0.30 | 2.7 | 0.08 | 29 | 5.4 | 23.36 | 1.36 |
| Dec-86 | 0 | 0 | 616 | 124 | 0.42 | 3.0 | 0.09 | 33 | 7.1 | 23.58 | 1.34 |
| Jan-87 | 0 | 0 | 631 | 128 | 0.43 | 3.0 | 0.10 | 32 | 7.4 | 24.29 | 1.32 |
| Feb-87 | 0 | 0 | 693 | 146 | 0.49 | 3.5 | 0.12 | 45 | ***8.4*** | 26.21 | 1.32 |
| Mar-87 | 0 | 0 | 554 | 109 | 0.36 | 4.6 | 0.17 | 46 | 7.0 | 27.51 | 1.31 |
| Apr-87 | 0 | 0 | 405 | 67 | 0.21 | 5.0 | 0.18 | 45 | 4.9 | 27.92 | 1.32 |
| ***May-87*** | 414 | 0 | 409 | 68 | 0.21 | 3.9 | 0.14 | 45 | 4.8 | 27.74 | 1.31 |
| ***Jun-87*** | 517 | 0 | 356 | 53 | 0.16 | 3.3 | 0.11 | 36 | 3.7 | 27.65 | 1.30 |
| ***Jul-87*** | 54 | 5 | 324 | 45 | 0.13 | 2.7 | 0.08 | 29 | 3.0 | 27.57 | 1.30 |
| Aug-87 | 0 | 0 | 413 | 69 | 0.22 | 2.7 | 0.08 | 33 | 4.3 | 27.50 | 1.28 |
| Sep-87 | 0 | 0 | 484 | 88 | 0.29 | 2.8 | 0.09 | 37 | 5.3 | 27.41 | 1.26 |
| Oct-87 | 0 | 0 | 674 | 140 | 0.47 | 2.8 | 0.09 | 46 | 7.7 | 26.93 | 1.24 |
| Nov-87 | 0 | 0 | 636 | 130 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 26.46 | 1.23 |
| Dec-87 | 0 | 0 | 665 | 138 | 0.47 | 3.2 | 0.10 | 39 | 7.9 | 24.98 | 1.19 |
| Jan-88 | 0 | 0 | 624 | 127 | 0.43 | 4.9 | 0.18 | 42 | ***8.1*** | 25.60 | 1.17 |
| ***Feb-88*** | 139 | 0 | 503 | 94 | 0.31 | 5.6 | 0.21 | 45 | 6.6 | 27.28 | 1.22 |
| Mar-88 | 0 | 0 | 524 | 99 | 0.33 | 5.5 | 0.20 | 51 | 6.9 | 26.97 | 1.21 |
| Apr-88 | 0 | 0 | 506 | 94 | 0.31 | 4.7 | 0.17 | 50 | 6.3 | 26.79 | 1.21 |
| May-88 | 0 | 0 | 458 | 81 | 0.26 | 4.4 | 0.16 | 47 | 5.5 | 26.71 | 1.20 |
| Jun-88 | 0 | 0 | 469 | 84 | 0.27 | 4.1 | 0.15 | 46 | 5.6 | 26.63 | 1.20 |
| Jul-88 | 0 | 0 | 432 | 74 | 0.24 | 3.6 | 0.12 | 45 | 5.0 | 26.34 | 1.18 |
| Aug-88 | 0 | 0 | 494 | 91 | 0.30 | 3.6 | 0.12 | 49 | 5.9 | 25.48 | 1.14 |
| Sep-88 | 0 | 0 | 580 | 114 | 0.38 | 3.2 | 0.11 | 49 | 6.8 | 24.11 | 1.10 |
| Oct-88 | 0 | 0 | 732 | 156 | 0.53 | 3.0 | 0.09 | 52 | ***8.5*** | 23.62 | 1.09 |
| Nov-88 | 0 | 0 | 733 | 156 | 0.53 | 2.9 | 0.09 | 45 | ***8.5*** | 23.21 | 1.08 |
| Dec-88 | 0 | 0 | 691 | 145 | 0.49 | 3.0 | 0.10 | 38 | ***8.0*** | 22.86 | 1.07 |
| Jan-89 | 0 | 0 | 698 | 147 | 0.50 | 3.1 | 0.10 | 36 | ***8.2*** | 22.26 | 1.05 |
| Feb-89 | 0 | 0 | 694 | 146 | 0.49 | 3.6 | 0.12 | 47 | ***8.5*** | 21.09 | 0.97 |
| Mar-89 | 0 | 0 | 458 | 81 | 0.26 | 5.2 | 0.19 | 44 | 5.8 | 20.68 | 0.82 |
| Apr-89 | 0 | 0 | 294 | 36 | 0.10 | 5.5 | 0.20 | 40 | 3.0 | 21.90 | 0.85 |
| May-89 | 0 | 0 | 348 | 51 | 0.16 | 4.9 | 0.18 | 43 | 3.9 | 22.02 | 0.85 |
| ***Jun-89*** | 60 | 0 | 309 | 40 | 0.12 | 3.4 | 0.11 | 34 | 2.9 | 22.08 | 0.85 |
| ***Jul-89*** | 105 | 0 | 363 | 55 | 0.17 | 3.0 | 0.10 | 34 | 3.7 | 22.00 | 0.84 |
| Aug-89 | 0 | 0 | 388 | 62 | 0.20 | 2.7 | 0.08 | 32 | 4.0 | 21.92 | 0.80 |
| Sep-89 | 0 | 0 | 501 | 93 | 0.31 | 2.6 | 0.08 | 35 | 5.4 | 22.26 | 0.82 |
| Oct-89 | 0 | 0 | 645 | 132 | 0.45 | 2.6 | 0.08 | 41 | 7.2 | 21.78 | 0.79 |
| Nov-89 | 0 | 0 | 622 | 126 | 0.42 | 2.8 | 0.09 | 37 | 7.1 | 21.68 | 0.79 |
| Dec-89 | 0 | 0 | 621 | 128 | 0.42 | 3.2 | 0.11 | 37 | 7.4 | 21.97 | 0.79 |
| Jan-90 | 0 | 0 | 673 | 140 | 0.47 | 3.6 | 0.12 | 40 | ***8.3*** | 21.75 | 0.79 |
| Feb-90 | 0 | 0 | 662 | 137 | 0.46 | 5.0 | 0.18 | 51 | ***8.6*** | 21.54 | 0.78 |
| Mar-90 | 0 | 0 | 550 | 106 | 0.35 | 5.4 | 0.20 | 53 | 7.3 | 20.29 | 0.76 |
| Apr-90 | 0 | 0 | 594 | 118 | 0.40 | 5.0 | 0.18 | 60 | 7.7 | 19.72 | 0.74 |
| May-90 | 0 | 0 | 453 | 80 | 0.26 | 4.7 | 0.17 | 49 | 5.5 | 19.61 | 0.73 |
| Jun-90 | 0 | 0 | 439 | 76 | 0.24 | 3.8 | 0.13 | 48 | 5.2 | 19.68 | 0.73 |
| Jul-90 | 0 | 0 | 453 | 80 | 0.26 | 3.7 | 0.13 | 48 | 5.4 | 19.52 | 0.72 |
| Aug-90 | 0 | 0 | 521 | 99 | 0.33 | 3.8 | 0.13 | 54 | 6.4 | 19.10 | 0.70 |
| Sep-90 | 0 | 0 | 566 | 111 | 0.37 | 3.4 | 0.11 | 51 | 6.8 | 18.75 | 0.68 |
| Oct-90 | 0 | 0 | 760 | 164 | 0.56 | 3.0 | 0.10 | 55 | ***8.9*** | 18.78 | 0.68 |
| Nov-90 | 0 | 0 | 720 | 153 | 0.52 | 3.0 | 0.10 | 45 | ***8.4*** | 18.46 | 0.68 |
| Dec-90 | 0 | 0 | 613 | 124 | 0.42 | 2.9 | 0.09 | 33 | 7.0 | 18.15 | 0.67 |
| Jan-91 | 0 | 0 | 694 | 146 | 0.49 | 3.2 | 0.11 | 37 | ***8.3*** | 16.55 | 0.63 |
| Feb-91 | 0 | 0 | 783 | 170 | 0.58 | 3.6 | 0.12 | 53 | ***9.6*** | 14.49 | 0.55 |
| Mar-91 | 0 | 0 | 564 | 110 | 0.37 | 5.1 | 0.19 | 51 | 7.3 | 14.43 | 0.54 |
| Apr-91 | 0 | 0 | 396 | 64 | 0.20 | 5.9 | 0.22 | 51 | 5.0 | 15.75 | 0.60 |
| May-91 | 0 | 0 | 377 | 59 | 0.18 | 4.7 | 0.17 | 44 | 4.3 | 15.87 | 0.61 |
| Jun-91 | 0 | 0 | 418 | 70 | 0.22 | 3.8 | 0.13 | 46 | 4.9 | 15.95 | 0.62 |
| Jul-91 | 0 | 0 | 456 | 81 | 0.26 | 3.8 | 0.13 | 48 | 5.4 | 15.86 | 0.62 |
| Aug-91 | 0 | 0 | 520 | 98 | 0.32 | 3.9 | 0.13 | 55 | 6.4 | 15.82 | 0.62 |
| Sep-91 | 0 | 0 | 571 | 112 | 0.37 | 3.4 | 0.11 | 51 | 6.8 | 15.73 | 0.61 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-8 Monthly Average Water Quality at
Tracy Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 515 | 97 | 0.32 | 2.4 | 0.07 | 31 | 5.5 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 393 | 84 | 0.20 | 2.6 | 0.08 | 24 | 4.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 599 | 120 | 0.40 | 3.1 | 0.10 | 35 | 7.0 | n/a | n/a |
| Jan-76 | 0 | 0 | 616 | 125 | 0.42 | 3.3 | 0.11 | 34 | 7.4 | n/a | n/a |
| Feb-76 | 0 | 0 | 690 | 145 | 0.49 | 3.2 | 0.11 | 42 | ***8.2*** | n/a | n/a |
| Mar-76 | 0 | 0 | 613 | 124 | 0.42 | 3.1 | 0.10 | 40 | 7.2 | n/a | n/a |
| Apr-76 | 0 | 0 | 560 | 109 | 0.36 | 3.1 | 0.10 | 43 | 6.5 | n/a | n/a |
| May-76 | 0 | 0 | 448 | 78 | 0.25 | 3.2 | 0.10 | 40 | 5.0 | n/a | n/a |
| Jun-76 | 0 | 0 | 418 | 70 | 0.22 | 3.1 | 0.10 | 38 | 4.6 | n/a | n/a |
| Jul-76 | 0 | 0 | 410 | 68 | 0.22 | 3.0 | 0.10 | 36 | 4.4 | n/a | n/a |
| Aug-76 | 0 | 0 | 507 | 95 | 0.31 | 2.9 | 0.09 | 41 | 5.7 | n/a | n/a |
| Sep-76 | 0 | 0 | 516 | 97 | 0.32 | 2.7 | 0.08 | 38 | 5.7 | n/a | n/a |
| Oct-76 | 0 | 0 | 690 | 145 | 0.49 | 2.9 | 0.09 | 48 | 7.9 | n/a | n/a |
| Nov-76 | 0 | 0 | 660 | 136 | 0.46 | 3.1 | 0.10 | 44 | 7.8 | n/a | n/a |
| Dec-76 | 0 | 0 | 560 | 109 | 0.36 | 3.6 | 0.12 | 37 | 6.8 | n/a | n/a |
| Jan-77 | 0 | 0 | 691 | 145 | 0.49 | 3.6 | 0.12 | 40 | ***8.5*** | n/a | n/a |
| Feb-77 | 0 | 0 | 783 | 170 | 0.58 | 3.9 | 0.13 | 56 | ***9.9*** | n/a | n/a |
| Mar-77 | 0 | 0 | 1066 | ***247*** | 0.86 | 3.7 | 0.13 | ***92*** | ***12.9*** | n/a | n/a |
| Apr-77 | 0 | 0 | 657 | 136 | 0.46 | 3.5 | 0.12 | 56 | ***8.0*** | n/a | n/a |
| May-77 | 0 | 0 | 543 | 104 | 0.35 | 3.4 | 0.11 | 50 | 6.5 | n/a | n/a |
| Jun-77 | 0 | 0 | 568 | 111 | 0.37 | 3.4 | 0.11 | 52 | 6.8 | n/a | n/a |
| Jul-77 | 0 | 0 | 539 | 103 | 0.34 | 3.6 | 0.12 | 52 | 6.5 | n/a | n/a |
| Aug-77 | 0 | 0 | 465 | 83 | 0.27 | 3.5 | 0.12 | 45 | 5.4 | n/a | n/a |
| Sep-77 | 0 | 0 | 596 | 119 | 0.40 | 3.2 | 0.10 | 49 | 7.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 782 | 170 | 0.58 | 3.0 | 0.10 | 57 | ***9.1*** | n/a | n/a |
| Nov-77 | 0 | 0 | 750 | 161 | 0.55 | 3.0 | 0.10 | 48 | ***8.7*** | n/a | n/a |
| Dec-77 | 0 | 0 | 783 | 165 | 0.56 | 2.9 | 0.09 | 40 | ***8.8*** | n/a | n/a |
| Jan-78 | 0 | 0 | 530 | 101 | 0.33 | 6.8 | 0.26 | 48 | 7.5 | n/a | n/a |
| Feb-78 | 0 | 0 | 311 | 41 | 0.12 | 10.1 | 0.40 | 54 | 4.0 | n/a | n/a |
| Mar-78 | 0 | 0 | 340 | 49 | 0.15 | 4.6 | 0.16 | 33 | 3.6 | n/a | n/a |
| Apr-78 | 0 | 0 | 242 | 22 | 0.05 | 3.9 | 0.14 | 32 | 1.7 | n/a | n/a |
| May-78 | 0 | 0 | 230 | 19 | 0.04 | 3.8 | 0.13 | 32 | 1.4 | n/a | n/a |
| Jun-78 | 0 | 0 | 238 | 21 | 0.05 | 3.5 | 0.12 | 31 | 1.5 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 309 | 41 | 0.12 | 4.1 | 0.15 | 35 | 3.0 | n/a | n/a |
| Aug-78 | 0 | 0 | 349 | 52 | 0.16 | 3.0 | 0.10 | 33 | 3.5 | n/a | n/a |
| Sep-78 | 0 | 0 | 505 | 94 | 0.31 | 2.6 | 0.08 | 36 | 5.5 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 551 | 107 | 0.35 | 2.7 | 0.08 | 37 | 6.1 | 21.16 | 0.81 |
| Nov-78 | 0 | 0 | 508 | 95 | 0.31 | 2.8 | 0.09 | 31 | 5.6 | 21.24 | 0.81 |
| Dec-78 | 0 | 0 | 653 | 135 | 0.45 | 2.8 | 0.09 | 33 | 7.4 | 21.32 | 0.81 |
| Jan-79 | 0 | 0 | 480 | 87 | 0.28 | 3.9 | 0.13 | 32 | 5.8 | 21.03 | 0.80 |
| Feb-79 | 0 | 0 | 327 | 45 | 0.14 | 5.1 | 0.19 | 31 | 3.5 | 20.71 | 0.80 |
| Mar-79 | 0 | 0 | 310 | 41 | 0.12 | 5.7 | 0.21 | 37 | 3.3 | 19.85 | 0.82 |
| Apr-79 | 0 | 0 | 321 | 44 | 0.13 | 3.8 | 0.13 | 36 | 3.3 | 19.49 | 0.85 |
| May-79 | 0 | 0 | 291 | 36 | 0.10 | 3.3 | 0.11 | 32 | 2.6 | 19.51 | 0.87 |
| ***Jun-79*** | 350 | 0 | 301 | 38 | 0.11 | 3.3 | 0.11 | 33 | 2.8 | 19.47 | 0.88 |
| ***Jul-79*** | 1415 | 1558 | 302 | 39 | 0.11 | 3.5 | 0.12 | 35 | 2.8 | 19.32 | 0.89 |
| Aug-79 | 0 | 0 | 369 | 57 | 0.18 | 2.8 | 0.09 | 32 | 3.7 | 19.16 | 0.90 |
| Sep-79 | 0 | 0 | 532 | 102 | 0.34 | 2.6 | 0.08 | 38 | 5.8 | 19.06 | 0.91 |
| Oct-79 | 0 | 0 | 691 | 145 | 0.49 | 2.7 | 0.08 | 45 | 7.7 | 19.21 | 0.91 |
| Nov-79 | 0 | 0 | 565 | 111 | 0.37 | 2.5 | 0.07 | 31 | 6.2 | 19.25 | 0.91 |
| Dec-79 | 0 | 0 | 540 | 104 | 0.34 | 2.8 | 0.09 | 29 | 6.1 | 19.74 | 0.92 |
| Jan-80 | 0 | 0 | 292 | 36 | 0.10 | 6.7 | 0.26 | 33 | 3.1 | 20.18 | 0.93 |
| Feb-80 | 0 | 0 | 180 | 10 | 0.01 | 4.1 | 0.14 | 21 | 0.5 | 19.36 | 0.96 |
| Mar-80 | 0 | 0 | 233 | 20 | 0.04 | 4.3 | 0.15 | 26 | 1.5 | 18.09 | 0.96 |
| Apr-80 | 0 | 0 | 284 | 34 | 0.09 | 3.4 | 0.11 | 30 | 2.5 | 18.26 | 1.00 |
| May-80 | 0 | 0 | 277 | 32 | 0.09 | 3.2 | 0.10 | 30 | 2.3 | 18.06 | 1.01 |
| Jun-80 | 0 | 0 | 276 | 32 | 0.08 | 3.3 | 0.11 | 31 | 2.3 | 18.09 | 1.02 |
| ***Jul-80*** | 1844 | 1601 | 303 | 39 | 0.11 | 4.1 | 0.15 | 35 | 2.9 | 18.16 | 1.04 |
| Aug-80 | 0 | 0 | 337 | 48 | 0.14 | 3.1 | 0.10 | 33 | 3.3 | 18.31 | 1.07 |
| Sep-80 | 0 | 0 | 455 | 81 | 0.26 | 2.6 | 0.08 | 34 | 4.9 | 18.60 | 1.09 |
| ***Oct-80*** | 49 | 0 | 515 | 97 | 0.32 | 2.7 | 0.08 | 36 | 5.7 | 18.80 | 1.10 |
| Nov-80 | 0 | 0 | 473 | 85 | 0.28 | 2.7 | 0.08 | 29 | 5.2 | 19.05 | 1.12 |
| Dec-80 | 0 | 0 | 583 | 115 | 0.39 | 2.8 | 0.09 | 30 | 6.6 | 18.85 | 1.12 |
| Jan-81 | 0 | 0 | 601 | 120 | 0.40 | 3.2 | 0.10 | 32 | 7.1 | 18.43 | 1.12 |
| Feb-81 | 0 | 0 | 526 | 100 | 0.33 | 3.4 | 0.11 | 35 | 6.3 | 18.44 | 1.08 |
| Mar-81 | 0 | 0 | 508 | 95 | 0.31 | 3.7 | 0.13 | 41 | 6.2 | 18.61 | 1.02 |

Table 2B-8 Monthly Average Water Quality at
Tracy Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 403 | 66 | 0.21 | 3.4 | 0.11 | 37 | 4.5 | 18.82 | 1.00 |
| ***May-81*** | 19 | 0 | 380 | 60 | 0.19 | 3.3 | 0.11 | 37 | 4.1 | 19.19 | 1.01 |
| ***Jun-81*** | 439 | 0 | 343 | 50 | 0.15 | 3.1 | 0.10 | 34 | 3.4 | 19.31 | 0.99 |
| ***Jul-81*** | 664 | 283 | 328 | 46 | 0.14 | 3.0 | 0.10 | 31 | 3.1 | 19.58 | 0.99 |
| Aug-81 | 0 | 0 | 456 | 81 | 0.26 | 2.6 | 0.08 | 34 | 4.8 | 19.67 | 0.98 |
| Sep-81 | 0 | 0 | 562 | 110 | 0.37 | 2.6 | 0.08 | 38 | 6.2 | 19.94 | 0.98 |
| Oct-81 | 0 | 0 | 718 | 152 | 0.52 | 2.7 | 0.08 | 46 | ***8.1*** | 20.08 | 0.98 |
| Nov-81 | 0 | 0 | 679 | 142 | 0.48 | 2.9 | 0.09 | 41 | 7.8 | 20.14 | 0.97 |
| Dec-81 | 0 | 0 | 480 | 87 | 0.28 | 4.1 | 0.14 | 32 | 5.7 | 20.75 | 0.98 |
| Jan-82 | 0 | 0 | 381 | 60 | 0.19 | 8.1 | 0.32 | 44 | 5.2 | 20.75 | 1.00 |
| Feb-82 | 0 | 0 | 247 | 24 | 0.06 | 5.4 | 0.20 | 29 | 1.9 | 20.52 | 1.03 |
| Mar-82 | 0 | 0 | 251 | 25 | 0.06 | 3.3 | 0.11 | 24 | 1.8 | 20.33 | 1.04 |
| Apr-82 | 0 | 0 | 155 | 10 | 0.01 | 4.1 | 0.14 | 26 | 0.5 | 20.19 | 1.02 |
| May-82 | 0 | 0 | 172 | 10 | 0.01 | 3.8 | 0.13 | 31 | 0.5 | 19.92 | 1.02 |
| Jun-82 | 0 | 0 | 242 | 22 | 0.05 | 3.4 | 0.11 | 30 | 1.6 | 19.72 | 1.03 |
| ***Jul-82*** | 1836 | 1613 | 296 | 37 | 0.10 | 4.1 | 0.14 | 34 | 2.7 | 19.57 | 1.03 |
| Aug-82 | 0 | 0 | 359 | 54 | 0.17 | 3.1 | 0.10 | 34 | 3.7 | 19.54 | 1.03 |
| Sep-82 | 0 | 0 | 468 | 84 | 0.27 | 2.5 | 0.07 | 33 | 4.9 | 19.52 | 1.03 |
| Oct-82 | 0 | 0 | 300 | 38 | 0.11 | 3.0 | 0.09 | 27 | 2.6 | 19.36 | 1.03 |
| Nov-82 | 0 | 0 | 258 | 26 | 0.07 | 3.3 | 0.11 | 24 | 1.9 | 18.61 | 1.04 |
| Dec-82 | 0 | 0 | 151 | 10 | 0.01 | 3.6 | 0.12 | 20 | 0.5 | 17.88 | 1.05 |
| Jan-83 | 0 | 0 | 221 | 16 | 0.03 | 4.0 | 0.14 | 21 | 1.2 | 17.07 | 1.05 |
| Feb-83 | 0 | 0 | 154 | 10 | 0.01 | 4.8 | 0.17 | 24 | 0.5 | 16.91 | 1.03 |
| Mar-83 | 0 | 0 | 200 | 11 | 0.01 | 5.4 | 0.20 | 29 | 0.6 | 16.88 | 1.02 |
| Apr-83 | 0 | 0 | 186 | 10 | 0.01 | 5.2 | 0.19 | 32 | 0.5 | 16.76 | 1.01 |
| May-83 | 0 | 0 | 157 | 10 | 0.01 | 4.8 | 0.17 | 32 | 0.5 | 16.65 | 1.02 |
| Jun-83 | 0 | 0 | 152 | 10 | 0.01 | 3.7 | 0.13 | 31 | 0.5 | 16.51 | 1.04 |
| Jul-83 | 0 | 0 | 187 | 10 | 0.01 | 3.4 | 0.11 | 28 | 0.5 | 16.31 | 1.04 |
| Aug-83 | 0 | 0 | 274 | 31 | 0.08 | 2.8 | 0.08 | 26 | 2.1 | 16.10 | 1.04 |
| Sep-83 | 0 | 0 | 351 | 52 | 0.16 | 2.7 | 0.08 | 29 | 3.4 | 15.94 | 1.04 |
| Oct-83 | 0 | 0 | 272 | 30 | 0.08 | 3.1 | 0.10 | 27 | 2.2 | 15.69 | 1.04 |
| Nov-83 | 0 | 0 | 202 | 11 | 0.01 | 3.3 | 0.11 | 22 | 0.6 | 15.10 | 1.04 |
| Dec-83 | 0 | 0 | 156 | 10 | 0.01 | 3.8 | 0.13 | 21 | 0.5 | 14.66 | 1.05 |
| Jan-84 | 0 | 0 | 176 | 10 | 0.01 | 4.4 | 0.15 | 19 | 0.5 | 13.70 | 1.04 |
| Feb-84 | 0 | 0 | 268 | 29 | 0.08 | 3.4 | 0.11 | 23 | 2.2 | 12.87 | 1.03 |
| Mar-84 | 0 | 0 | 347 | 51 | 0.15 | 3.1 | 0.10 | 27 | 3.5 | 12.51 | 1.03 |
| ***Apr-84*** | 188 | 0 | 370 | 57 | 0.18 | 2.9 | 0.09 | 30 | 3.8 | 12.25 | 1.03 |
| May-84 | 0 | 0 | 351 | 52 | 0.16 | 2.8 | 0.09 | 31 | 3.5 | 12.16 | 1.02 |
| ***Jun-84*** | 731 | 0 | 344 | 50 | 0.15 | 3.2 | 0.10 | 34 | 3.5 | 12.19 | 1.03 |
| ***Jul-84*** | 873 | 1535 | 288 | 35 | 0.10 | 3.3 | 0.11 | 32 | 2.5 | 12.19 | 1.03 |
| Aug-84 | 0 | 0 | 315 | 42 | 0.12 | 2.7 | 0.08 | 28 | 2.8 | 12.09 | 1.03 |
| Sep-84 | 0 | 0 | 462 | 82 | 0.27 | 2.6 | 0.08 | 34 | 4.9 | 11.73 | 1.03 |
| Oct-84 | 0 | 0 | 601 | 120 | 0.40 | 2.6 | 0.08 | 38 | 6.7 | 11.48 | 1.03 |
| Nov-84 | 0 | 0 | 595 | 116 | 0.39 | 2.8 | 0.09 | 36 | 6.6 | 11.52 | 1.04 |
| Dec-84 | 0 | 0 | 454 | 80 | 0.26 | 3.7 | 0.13 | 33 | 5.4 | 11.29 | 1.04 |
| ***Jan-85*** | 399 | 0 | 454 | 80 | 0.26 | 4.0 | 0.14 | 32 | 5.5 | 11.23 | 1.03 |
| ***Feb-85*** | 61 | 0 | 533 | 102 | 0.34 | 3.8 | 0.13 | 39 | 6.6 | 11.40 | 1.00 |
| Mar-85 | 0 | 0 | 523 | 99 | 0.33 | 3.7 | 0.13 | 42 | 6.4 | 12.08 | 0.98 |
| Apr-85 | 0 | 0 | 496 | 92 | 0.30 | 3.7 | 0.13 | 47 | 6.0 | 12.73 | 0.99 |
| May-85 | 0 | 0 | 408 | 67 | 0.21 | 3.3 | 0.11 | 39 | 4.5 | 13.11 | 0.97 |
| Jun-85 | 0 | 0 | 330 | 46 | 0.14 | 3.0 | 0.09 | 31 | 3.2 | 13.35 | 0.95 |
| ***Jul-85*** | 38 | 0 | 354 | 53 | 0.16 | 2.6 | 0.08 | 28 | 3.4 | 13.54 | 0.95 |
| Aug-85 | 0 | 0 | 502 | 93 | 0.31 | 2.4 | 0.07 | 34 | 5.3 | 13.71 | 0.93 |
| Sep-85 | 0 | 0 | 512 | 96 | 0.32 | 2.5 | 0.07 | 34 | 5.5 | 14.07 | 0.93 |
| Oct-85 | 0 | 0 | 662 | 137 | 0.46 | 2.7 | 0.08 | 43 | 7.4 | 14.05 | 0.93 |
| Nov-85 | 0 | 0 | 640 | 131 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 14.61 | 0.92 |
| Dec-85 | 0 | 0 | 616 | 125 | 0.42 | 4.1 | 0.14 | 39 | 7.5 | 15.08 | 0.90 |
| Jan-86 | 0 | 0 | 577 | 114 | 0.38 | 5.0 | 0.18 | 40 | 7.5 | 16.07 | 0.91 |
| Feb-86 | 0 | 0 | 363 | 55 | 0.17 | 9.9 | 0.40 | 58 | 5.1 | 16.91 | 0.92 |
| Mar-86 | 0 | 0 | 205 | 12 | 0.02 | 4.5 | 0.16 | 25 | 0.7 | 17.33 | 0.97 |
| Apr-86 | 0 | 0 | 229 | 19 | 0.04 | 4.0 | 0.14 | 31 | 1.4 | 17.39 | 0.99 |
| ***May-86*** | 290 | 0 | 263 | 28 | 0.07 | 3.7 | 0.13 | 34 | 2.1 | 17.48 | 0.99 |
| Jun-86 | 0 | 0 | 273 | 31 | 0.08 | 3.3 | 0.11 | 32 | 2.3 | 17.53 | 0.97 |
| ***Jul-86*** | 1837 | 1535 | 319 | 43 | 0.13 | 5.3 | 0.19 | 44 | 3.4 | 17.64 | 0.96 |
| Aug-86 | 0 | 0 | 378 | 59 | 0.19 | 3.5 | 0.12 | 40 | 4.1 | 17.59 | 0.93 |
| Sep-86 | 0 | 0 | 451 | 79 | 0.26 | 2.8 | 0.09 | 35 | 4.9 | 17.84 | 0.94 |

Table 2B-8 Monthly Average Water Quality at
Tracy Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 489 | 90 | 0.29 | 2.6 | 0.08 | 32 | 5.2 | 18.08 | 0.94 |
| Nov-86 | 0 | 0 | 495 | 92 | 0.30 | 2.7 | 0.08 | 29 | 5.4 | 18.59 | 0.93 |
| Dec-86 | 0 | 0 | 616 | 124 | 0.42 | 3.0 | 0.10 | 34 | 7.1 | 19.29 | 0.93 |
| Jan-87 | 0 | 0 | 637 | 130 | 0.44 | 3.1 | 0.10 | 32 | 7.4 | 19.92 | 0.94 |
| Feb-87 | 0 | 0 | 706 | 149 | 0.51 | 3.4 | 0.11 | 45 | ***8.5*** | 20.20 | 0.93 |
| Mar-87 | 0 | 0 | 580 | 115 | 0.38 | 4.5 | 0.16 | 47 | 7.3 | 20.55 | 0.92 |
| Apr-87 | 0 | 0 | 438 | 76 | 0.34 | 4.8 | 0.18 | 46 | 5.3 | 20.81 | 0.92 |
| ***May-87*** | 414 | 0 | 413 | 69 | 0.22 | 3.9 | 0.14 | 46 | 4.8 | 20.81 | 0.93 |
| ***Jun-87*** | 517 | 0 | 356 | 53 | 0.16 | 3.3 | 0.11 | 36 | 3.7 | 20.88 | 0.93 |
| ***Jul-87*** | 54 | 5 | 324 | 45 | 0.13 | 2.7 | 0.08 | 29 | 3.0 | 20.91 | 0.93 |
| Aug-87 | 0 | 0 | 414 | 69 | 0.22 | 2.7 | 0.08 | 33 | 4.3 | 21.00 | 0.93 |
| Sep-87 | 0 | 0 | 484 | 88 | 0.29 | 2.7 | 0.08 | 36 | 5.3 | 21.25 | 0.93 |
| Oct-87 | 0 | 0 | 672 | 140 | 0.47 | 2.8 | 0.09 | 46 | 7.6 | 21.02 | 0.92 |
| Nov-87 | 0 | 0 | 637 | 130 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 20.88 | 0.92 |
| Dec-87 | 0 | 0 | 673 | 140 | 0.47 | 3.2 | 0.11 | 40 | ***8.0*** | 20.40 | 0.90 |
| Jan-88 | 0 | 0 | 653 | 134 | 0.45 | 4.7 | 0.17 | 42 | ***8.4*** | 20.92 | 0.90 |
| ***Feb-88*** | 139 | 0 | 537 | 102 | 0.34 | 5.5 | 0.20 | 47 | 7.1 | 21.38 | 0.90 |
| Mar-88 | 0 | 0 | 558 | 109 | 0.36 | 5.6 | 0.21 | 55 | 7.5 | 21.33 | 0.92 |
| Apr-88 | 0 | 0 | 524 | 99 | 0.33 | 4.8 | 0.17 | 52 | 6.6 | 21.09 | 0.92 |
| May-88 | 0 | 0 | 460 | 82 | 0.27 | 4.4 | 0.16 | 47 | 5.5 | 20.94 | 0.91 |
| Jun-88 | 0 | 0 | 470 | 85 | 0.28 | 4.1 | 0.15 | 46 | 5.6 | 20.81 | 0.91 |
| Jul-88 | 0 | 0 | 433 | 74 | 0.24 | 3.6 | 0.12 | 45 | 5.0 | 20.64 | 0.89 |
| Aug-88 | 0 | 0 | 494 | 91 | 0.30 | 3.6 | 0.12 | 49 | 5.9 | 20.30 | 0.88 |
| Sep-88 | 0 | 0 | 581 | 115 | 0.38 | 3.2 | 0.10 | 49 | 6.8 | 19.69 | 0.86 |
| Oct-88 | 0 | 0 | 730 | 158 | 0.53 | 3.0 | 0.09 | 52 | ***8.5*** | 19.72 | 0.87 |
| Nov-88 | 0 | 0 | 732 | 156 | 0.53 | 2.9 | 0.09 | 45 | ***8.5*** | 19.57 | 0.86 |
| Dec-88 | 0 | 0 | 688 | 144 | 0.49 | 3.1 | 0.10 | 38 | ***8.1*** | 19.66 | 0.86 |
| Jan-89 | 0 | 0 | 698 | 147 | 0.50 | 3.2 | 0.10 | 36 | ***8.2*** | 19.67 | 0.85 |
| Feb-89 | 0 | 0 | 729 | 155 | 0.53 | 3.6 | 0.12 | 49 | ***9.0*** | 19.95 | 0.83 |
| Mar-89 | 0 | 0 | 544 | 105 | 0.35 | 5.6 | 0.21 | 54 | 7.3 | 19.84 | 0.76 |
| Apr-89 | 0 | 0 | 355 | 53 | 0.16 | 5.5 | 0.20 | 45 | 4.1 | 20.63 | 0.77 |
| May-89 | 0 | 0 | 352 | 52 | 0.16 | 4.9 | 0.18 | 44 | 4.0 | 20.78 | 0.77 |
| ***Jun-89*** | 60 | 0 | 307 | 40 | 0.12 | 3.4 | 0.11 | 34 | 2.9 | 20.88 | 0.77 |
| ***Jul-89*** | 105 | 0 | 364 | 56 | 0.17 | 3.0 | 0.10 | 34 | 3.7 | 20.88 | 0.76 |
| Aug-89 | 0 | 0 | 391 | 63 | 0.20 | 2.7 | 0.08 | 32 | 4.0 | 21.23 | 0.78 |
| Sep-89 | 0 | 0 | 500 | 93 | 0.30 | 2.6 | 0.08 | 35 | 5.4 | 21.10 | 0.77 |
| Oct-89 | 0 | 0 | 645 | 132 | 0.45 | 2.6 | 0.08 | 41 | 7.2 | 21.22 | 0.76 |
| Nov-89 | 0 | 0 | 624 | 127 | 0.43 | 2.8 | 0.09 | 37 | 7.1 | 21.20 | 0.76 |
| Dec-89 | 0 | 0 | 626 | 127 | 0.43 | 3.3 | 0.11 | 37 | 7.5 | 20.83 | 0.74 |
| Jan-90 | 0 | 0 | 682 | 143 | 0.48 | 3.6 | 0.12 | 40 | ***8.4*** | 20.88 | 0.75 |
| Feb-90 | 0 | 0 | 680 | 142 | 0.48 | 5.0 | 0.18 | 53 | ***8.9*** | 21.78 | 0.77 |
| Mar-90 | 0 | 0 | 573 | 113 | 0.38 | 5.5 | 0.20 | 55 | 7.6 | 22.48 | 0.80 |
| Apr-90 | 0 | 0 | 600 | 120 | 0.40 | 5.1 | 0.19 | 61 | 7.8 | 22.51 | 0.81 |
| May-90 | 0 | 0 | 456 | 81 | 0.26 | 4.7 | 0.17 | 49 | 5.6 | 22.26 | 0.79 |
| Jun-90 | 0 | 0 | 441 | 77 | 0.25 | 3.8 | 0.13 | 48 | 5.2 | 22.13 | 0.78 |
| Jul-90 | 0 | 0 | 453 | 80 | 0.26 | 3.7 | 0.13 | 48 | 5.4 | 21.76 | 0.76 |
| Aug-90 | 0 | 0 | 521 | 99 | 0.33 | 3.8 | 0.13 | 54 | 6.4 | 21.45 | 0.74 |
| Sep-90 | 0 | 0 | 569 | 112 | 0.37 | 3.4 | 0.11 | 50 | 6.8 | 21.04 | 0.72 |
| Oct-90 | 0 | 0 | 755 | 162 | 0.55 | 3.0 | 0.10 | 55 | ***8.8*** | 21.11 | 0.72 |
| Nov-90 | 0 | 0 | 725 | 154 | 0.53 | 3.0 | 0.10 | 45 | ***8.4*** | 21.04 | 0.72 |
| Dec-90 | 0 | 0 | 630 | 125 | 0.42 | 2.9 | 0.09 | 33 | 7.1 | 20.91 | 0.72 |
| Jan-91 | 0 | 0 | 693 | 146 | 0.49 | 3.1 | 0.10 | 36 | ***8.2*** | 20.28 | 0.70 |
| Feb-91 | 0 | 0 | 790 | 172 | 0.59 | 3.5 | 0.12 | 51 | ***9.6*** | 19.60 | 0.67 |
| Mar-91 | 0 | 0 | 594 | 119 | 0.40 | 5.3 | 0.20 | 55 | 7.9 | 19.43 | 0.64 |
| Apr-91 | 0 | 0 | 411 | 68 | 0.22 | 5.8 | 0.22 | 52 | 5.2 | 19.82 | 0.65 |
| May-91 | 0 | 0 | 382 | 60 | 0.19 | 4.7 | 0.17 | 44 | 4.4 | 19.76 | 0.66 |
| Jun-91 | 0 | 0 | 441 | 77 | 0.25 | 4.0 | 0.14 | 50 | 5.3 | 19.75 | 0.66 |
| Jul-91 | 0 | 0 | 457 | 81 | 0.26 | 3.8 | 0.13 | 49 | 5.5 | 19.52 | 0.65 |
| Aug-91 | 0 | 0 | 519 | 98 | 0.32 | 3.9 | 0.13 | 55 | 6.4 | 19.44 | 0.65 |
| Sep-91 | 0 | 0 | 573 | 113 | 0.38 | 3.4 | 0.11 | 51 | 6.9 | 19.31 | 0.64 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-9 Monthly Average Water Quality at
Rock Slough: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 563 | 127 | 0.43 | 2.0 | 0.05 | 30 | 6.4 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 420 | 88 | 0.29 | 2.3 | 0.07 | 25 | 5.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 712 | 167 | 0.57 | 2.8 | 0.09 | 38 | ***8.7*** | n/a | n/a |
| Jan-76 | 0 | 0 | 731 | 172 | 0.59 | 2.8 | 0.09 | 36 | ***9.0*** | n/a | n/a |
| Feb-76 | 0 | 0 | 711 | 167 | 0.57 | 2.6 | 0.08 | 38 | ***8.6*** | n/a | n/a |
| Mar-76 | 0 | 0 | 424 | 90 | 0.29 | 2.5 | 0.07 | 27 | 5.2 | n/a | n/a |
| Apr-76 | 0 | 0 | 325 | 63 | 0.20 | 2.6 | 0.08 | 28 | 4.0 | n/a | n/a |
| May-76 | 0 | 0 | 342 | 68 | 0.21 | 2.7 | 0.08 | 32 | 4.3 | n/a | n/a |
| Jun-76 | 0 | 0 | 379 | 78 | 0.25 | 2.4 | 0.07 | 31 | 4.6 | n/a | n/a |
| Jul-76 | 0 | 0 | 447 | 96 | 0.32 | 2.4 | 0.07 | 33 | 5.4 | n/a | n/a |
| Aug-76 | 0 | 0 | 591 | 134 | 0.45 | 2.3 | 0.07 | 40 | 7.0 | n/a | n/a |
| Sep-76 | 0 | 0 | 566 | 128 | 0.43 | 2.2 | 0.06 | 36 | 6.6 | n/a | n/a |
| Oct-76 | 0 | 0 | 819 | 196 | 0.67 | 2.3 | 0.07 | 49 | ***9.3*** | n/a | n/a |
| Nov-76 | 0 | 0 | 771 | 183 | 0.63 | 2.3 | 0.07 | 40 | ***8.8*** | n/a | n/a |
| Dec-76 | 0 | 0 | 577 | 131 | 0.44 | 2.1 | 0.06 | 25 | 6.7 | n/a | n/a |
| Jan-77 | 0 | 0 | 850 | 204 | 0.70 | 2.4 | 0.07 | 36 | ***9.8*** | n/a | n/a |
| Feb-77 | 0 | 0 | 846 | 203 | 0.70 | 3.0 | 0.09 | 50 | ***10.3*** | n/a | n/a |
| Mar-77 | 0 | 0 | 611 | 140 | 0.47 | 3.2 | 0.10 | 45 | 8.0 | n/a | n/a |
| Apr-77 | 0 | 0 | 409 | 86 | 0.28 | 2.6 | 0.08 | 33 | 5.1 | n/a | n/a |
| May-77 | 0 | 0 | 431 | 92 | 0.30 | 2.7 | 0.08 | 36 | 5.4 | n/a | n/a |
| Jun-77 | 0 | 0 | 586 | 133 | 0.45 | 2.8 | 0.09 | 48 | 7.4 | n/a | n/a |
| Jul-77 | 0 | 0 | 534 | 119 | 0.40 | 2.7 | 0.08 | 43 | 6.7 | n/a | n/a |
| Aug-77 | 0 | 0 | 450 | 97 | 0.32 | 2.6 | 0.08 | 37 | 5.6 | n/a | n/a |
| Sep-77 | 0 | 0 | 751 | 177 | 0.61 | 2.4 | 0.07 | 51 | ***8.8*** | n/a | n/a |
| Oct-77 | 0 | 0 | 934 | ***226*** | 0.78 | 2.4 | 0.07 | 57 | ***10.5*** | n/a | n/a |
| Nov-77 | 0 | 0 | 837 | 200 | 0.69 | 2.4 | 0.07 | 45 | ***9.6*** | n/a | n/a |
| Dec-77 | 0 | 0 | 996 | ***243*** | 0.84 | 2.7 | 0.08 | 52 | ***11.5*** | n/a | n/a |
| Jan-78 | 0 | 0 | 490 | 107 | 0.36 | 5.2 | 0.19 | 40 | 7.2 | n/a | n/a |
| Feb-78 | 0 | 0 | 284 | 52 | 0.16 | 6.1 | 0.23 | 38 | 4.2 | n/a | n/a |
| Mar-78 | 0 | 0 | 289 | 53 | 0.16 | 5.7 | 0.21 | 40 | 4.2 | n/a | n/a |
| Apr-78 | 0 | 0 | 276 | 50 | 0.15 | 4.1 | 0.14 | 34 | 3.6 | n/a | n/a |
| May-78 | 0 | 0 | 220 | 35 | 0.10 | 3.4 | 0.11 | 33 | 2.6 | n/a | n/a |
| Jun-78 | 0 | 0 | 223 | 36 | 0.10 | 3.2 | 0.10 | 31 | 2.6 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 241 | 41 | 0.12 | 5.4 | 0.20 | 45 | 3.5 | n/a | n/a |
| Aug-78 | 0 | 0 | 312 | 60 | 0.19 | 2.7 | 0.08 | 31 | 3.8 | n/a | n/a |
| Sep-78 | 0 | 0 | 578 | 131 | 0.44 | 2.2 | 0.06 | 36 | 6.7 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 642 | 148 | 0.50 | 2.1 | 0.06 | 36 | 7.4 | 1.76 | 0.05 |
| Nov-78 | 0 | 0 | 634 | 146 | 0.50 | 2.2 | 0.06 | 32 | 7.3 | 1.83 | 0.05 |
| Dec-78 | 0 | 0 | 811 | 194 | 0.67 | 2.2 | 0.06 | 34 | ***9.1*** | 1.85 | 0.05 |
| Jan-79 | 0 | 0 | 628 | 144 | 0.49 | 3.0 | 0.10 | 34 | ***8.0*** | 1.87 | 0.05 |
| Feb-79 | 0 | 0 | 345 | 69 | 0.22 | 4.5 | 0.16 | 33 | 4.8 | 1.86 | 0.05 |
| Mar-79 | 0 | 0 | 262 | 46 | 0.14 | 4.2 | 0.15 | 30 | 3.4 | 1.84 | 0.05 |
| Apr-79 | 0 | 0 | 245 | 42 | 0.12 | 2.9 | 0.09 | 28 | 2.9 | 1.82 | 0.05 |
| May-79 | 0 | 0 | 255 | 44 | 0.13 | 3.0 | 0.10 | 31 | 3.1 | 1.82 | 0.05 |
| ***Jun-79*** | 350 | 0 | 234 | 39 | 0.11 | 2.6 | 0.08 | 26 | 2.6 | 1.82 | 0.05 |
| ***Jul-79*** | 1415 | 1558 | 262 | 46 | 0.14 | 4.7 | 0.17 | 41 | 3.5 | 1.82 | 0.05 |
| Aug-79 | 0 | 0 | 365 | 75 | 0.24 | 2.5 | 0.07 | 31 | 4.5 | 1.82 | 0.05 |
| Sep-79 | 0 | 0 | 641 | 148 | 0.50 | 2.2 | 0.06 | 39 | 7.4 | 1.83 | 0.05 |
| Oct-79 | 0 | 0 | 817 | 195 | 0.67 | 2.1 | 0.06 | 44 | ***9.1*** | 1.84 | 0.05 |
| Nov-79 | 0 | 0 | 624 | 143 | 0.49 | 2.2 | 0.06 | 31 | 7.2 | 1.83 | 0.05 |
| Dec-79 | 0 | 0 | 592 | 135 | 0.45 | 2.5 | 0.07 | 30 | 7.2 | 1.86 | 0.05 |
| Jan-80 | 0 | 0 | 433 | 92 | 0.30 | 4.8 | 0.18 | 35 | 6.3 | 1.89 | 0.05 |
| Feb-80 | 0 | 0 | 247 | 42 | 0.12 | 6.1 | 0.23 | 36 | 3.5 | 1.86 | 0.05 |
| Mar-80 | 0 | 0 | 197 | 29 | 0.08 | 4.0 | 0.14 | 29 | 2.2 | 1.80 | 0.05 |
| Apr-80 | 0 | 0 | 245 | 42 | 0.12 | 3.2 | 0.10 | 30 | 3.0 | 1.75 | 0.05 |
| May-80 | 0 | 0 | 246 | 42 | 0.12 | 2.8 | 0.09 | 29 | 2.9 | 1.72 | 0.05 |
| Jun-80 | 0 | 0 | 242 | 41 | 0.12 | 2.8 | 0.09 | 29 | 2.8 | 1.70 | 0.05 |
| ***Jul-80*** | 1844 | 1601 | 249 | 43 | 0.12 | 5.6 | 0.21 | 47 | 3.4 | 1.66 | 0.05 |
| Aug-80 | 0 | 0 | 281 | 51 | 0.16 | 2.8 | 0.09 | 30 | 3.4 | 1.61 | 0.05 |
| Sep-80 | 0 | 0 | 505 | 111 | 0.37 | 2.2 | 0.06 | 33 | 6.0 | 1.60 | 0.06 |
| ***Oct-80*** | 49 | 0 | 579 | 131 | 0.44 | 2.2 | 0.06 | 34 | 6.7 | 1.55 | 0.06 |
| Nov-80 | 0 | 0 | 543 | 122 | 0.41 | 2.2 | 0.06 | 28 | 6.4 | 1.51 | 0.06 |
| Dec-80 | 0 | 0 | 657 | 152 | 0.52 | 2.2 | 0.06 | 29 | 7.6 | 1.47 | 0.06 |
| Jan-81 | 0 | 0 | 788 | 187 | 0.64 | 2.6 | 0.08 | 36 | ***9.4*** | 1.43 | 0.05 |
| Feb-81 | 0 | 0 | 382 | 78 | 0.25 | 2.9 | 0.09 | 27 | 4.9 | 1.45 | 0.05 |
| Mar-81 | 0 | 0 | 253 | 44 | 0.13 | 3.2 | 0.10 | 36 | 3.1 | 1.45 | 0.05 |

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Table 2B-9 Monthly Average Water Quality at
Rock Slough: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 241 | 41 | 0.12 | 3.0 | 0.09 | 28 | 2.8 | 1.44 | 0.05 |
| ***May-81*** | 19 | 0 | 305 | 58 | 0.18 | 3.0 | 0.10 | 33 | 3.8 | 1.43 | 0.05 |
| ***Jun-81*** | 439 | 0 | 283 | 52 | 0.16 | 2.5 | 0.07 | 27 | 3.3 | 1.44 | 0.05 |
| ***Jul-81*** | 664 | 283 | 327 | 64 | 0.20 | 2.6 | 0.08 | 31 | 4.0 | 1.47 | 0.05 |
| Aug-81 | 0 | 0 | 535 | 119 | 0.40 | 2.2 | 0.06 | 35 | 6.3 | 1.47 | 0.05 |
| Sep-81 | 0 | 0 | 683 | 159 | 0.54 | 2.1 | 0.06 | 40 | 7.7 | 1.49 | 0.05 |
| Oct-81 | 0 | 0 | 824 | 197 | 0.68 | 2.1 | 0.06 | 45 | ***8.1*** | 1.45 | 0.05 |
| Nov-81 | 0 | 0 | 767 | 182 | 0.62 | 2.6 | 0.08 | 46 | ***8.2*** | 1.42 | 0.04 |
| Dec-81 | 0 | 0 | 326 | 63 | 0.20 | 4.8 | 0.18 | 32 | 4.6 | 1.43 | 0.04 |
| Jan-82 | 0 | 0 | 269 | 48 | 0.14 | 4.5 | 0.16 | 25 | 3.6 | 1.39 | 0.05 |
| Feb-82 | 0 | 0 | 305 | 58 | 0.18 | 4.9 | 0.18 | 33 | 4.3 | 1.36 | 0.05 |
| Mar-82 | 0 | 0 | 307 | 58 | 0.18 | 4.9 | 0.18 | 36 | 4.3 | 1.36 | 0.05 |
| Apr-82 | 0 | 0 | 227 | 37 | 0.10 | 4.4 | 0.15 | 33 | 2.8 | 1.34 | 0.04 |
| May-82 | 0 | 0 | 183 | 25 | 0.06 | 3.7 | 0.12 | 33 | 1.9 | 1.34 | 0.04 |
| Jun-82 | 0 | 0 | 215 | 33 | 0.09 | 2.9 | 0.09 | 28 | 2.3 | 1.34 | 0.04 |
| ***Jul-82*** | 1836 | 1613 | 242 | 41 | 0.12 | 5.7 | 0.21 | 47 | 3.3 | 1.33 | 0.04 |
| Aug-82 | 0 | 0 | 319 | 61 | 0.19 | 2.9 | 0.09 | 34 | 4.0 | 1.33 | 0.05 |
| Sep-82 | 0 | 0 | 507 | 112 | 0.37 | 2.1 | 0.06 | 32 | 5.9 | 1.32 | 0.05 |
| Oct-82 | 0 | 0 | 293 | 55 | 0.17 | 2.4 | 0.07 | 24 | 3.4 | 1.30 | 0.05 |
| Nov-82 | 0 | 0 | 224 | 36 | 0.10 | 3.2 | 0.10 | 25 | 2.6 | 1.23 | 0.05 |
| Dec-82 | 0 | 0 | 290 | 54 | 0.17 | 3.9 | 0.13 | 29 | 3.9 | 1.19 | 0.05 |
| Jan-83 | 0 | 0 | 296 | 55 | 0.17 | 4.4 | 0.16 | 26 | 4.0 | 1.17 | 0.05 |
| Feb-83 | 0 | 0 | 141 | 14 | 0.02 | 4.8 | 0.18 | 24 | 0.9 | 1.16 | 0.05 |
| Mar-83 | 0 | 0 | 171 | 22 | 0.05 | 5.5 | 0.20 | 32 | 1.8 | 1.16 | 0.05 |
| Apr-83 | 0 | 0 | 188 | 26 | 0.07 | 5.1 | 0.19 | 35 | 2.1 | 1.15 | 0.05 |
| May-83 | 0 | 0 | 190 | 27 | 0.07 | 4.9 | 0.18 | 37 | 2.1 | 1.15 | 0.05 |
| Jun-83 | 0 | 0 | 139 | 13 | 0.02 | 3.6 | 0.12 | 30 | 0.8 | 1.15 | 0.05 |
| Jul-83 | 0 | 0 | 179 | 24 | 0.06 | 3.2 | 0.10 | 29 | 1.7 | 1.12 | 0.05 |
| Aug-83 | 0 | 0 | 244 | 41 | 0.12 | 2.3 | 0.07 | 24 | 2.6 | 1.11 | 0.05 |
| Sep-83 | 0 | 0 | 292 | 54 | 0.17 | 2.2 | 0.06 | 23 | 3.3 | 1.10 | 0.05 |
| Oct-83 | 0 | 0 | 237 | 40 | 0.11 | 2.7 | 0.08 | 25 | 2.7 | 1.07 | 0.05 |
| Nov-83 | 0 | 0 | 211 | 32 | 0.09 | 3.5 | 0.12 | 26 | 2.4 | 1.03 | 0.05 |
| Dec-83 | 0 | 0 | 159 | 19 | 0.04 | 3.9 | 0.13 | 23 | 1.4 | 0.99 | 0.05 |
| Jan-84 | 0 | 0 | 181 | 25 | 0.06 | 4.1 | 0.15 | 20 | 1.8 | 0.95 | 0.05 |
| Feb-84 | 0 | 0 | 242 | 41 | 0.12 | 3.3 | 0.11 | 24 | 2.9 | 0.91 | 0.05 |
| Mar-84 | 0 | 0 | 242 | 41 | 0.12 | 2.6 | 0.08 | 21 | 2.7 | 0.91 | 0.05 |
| ***Apr-84*** | 188 | 0 | 245 | 42 | 0.12 | 2.2 | 0.06 | 21 | 2.6 | 0.91 | 0.05 |
| May-84 | 0 | 0 | 290 | 54 | 0.16 | 2.5 | 0.07 | 27 | 3.4 | 0.91 | 0.05 |
| ***Jun-84*** | 731 | 0 | 262 | 46 | 0.14 | 2.4 | 0.07 | 25 | 2.9 | 0.90 | 0.05 |
| ***Jul-84*** | 873 | 1535 | 230 | 38 | 0.11 | 5.0 | 0.18 | 41 | 3.0 | 0.90 | 0.05 |
| Aug-84 | 0 | 0 | 264 | 47 | 0.14 | 2.4 | 0.07 | 25 | 3.0 | 0.88 | 0.05 |
| Sep-84 | 0 | 0 | 503 | 111 | 0.37 | 2.2 | 0.06 | 32 | 5.9 | 0.83 | 0.05 |
| Oct-84 | 0 | 0 | 648 | 150 | 0.51 | 2.1 | 0.06 | 36 | 7.4 | 0.81 | 0.05 |
| Nov-84 | 0 | 0 | 683 | 159 | 0.54 | 2.6 | 0.08 | 40 | ***8.2*** | 0.78 | 0.05 |
| Dec-84 | 0 | 0 | 358 | 72 | 0.23 | 3.4 | 0.11 | 29 | 4.8 | 0.77 | 0.05 |
| ***Jan-85*** | 399 | 0 | 378 | 77 | 0.25 | 3.4 | 0.11 | 27 | 5.1 | 0.77 | 0.05 |
| ***Feb-85*** | 61 | 0 | 414 | 87 | 0.28 | 3.1 | 0.10 | 30 | 5.4 | 0.78 | 0.05 |
| Mar-85 | 0 | 0 | 310 | 59 | 0.18 | 3.0 | 0.09 | 27 | 3.9 | 0.79 | 0.05 |
| Apr-85 | 0 | 0 | 279 | 51 | 0.15 | 3.0 | 0.10 | 30 | 3.4 | 0.79 | 0.05 |
| May-85 | 0 | 0 | 308 | 59 | 0.18 | 2.9 | 0.09 | 32 | 3.8 | 0.79 | 0.05 |
| Jun-85 | 0 | 0 | 264 | 47 | 0.14 | 2.4 | 0.07 | 26 | 3.0 | 0.81 | 0.05 |
| ***Jul-85*** | 38 | 0 | 396 | 82 | 0.27 | 2.2 | 0.06 | 29 | 4.7 | 0.82 | 0.05 |
| Aug-85 | 0 | 0 | 606 | 138 | 0.47 | 2.1 | 0.06 | 37 | 6.9 | 0.85 | 0.05 |
| Sep-85 | 0 | 0 | 580 | 132 | 0.44 | 2.1 | 0.06 | 34 | 6.6 | 0.90 | 0.04 |
| Oct-85 | 0 | 0 | 713 | 167 | 0.57 | 2.1 | 0.06 | 40 | ***8.1*** | 0.91 | 0.04 |
| Nov-85 | 0 | 0 | 691 | 161 | 0.55 | 2.2 | 0.06 | 35 | 7.9 | 0.97 | 0.04 |
| Dec-85 | 0 | 0 | 622 | 143 | 0.48 | 3.0 | 0.10 | 38 | 8.0 | 1.00 | 0.04 |
| Jan-86 | 0 | 0 | 597 | 136 | 0.46 | 4.3 | 0.15 | 39 | ***8.2*** | 1.03 | 0.04 |
| Feb-86 | 0 | 0 | 354 | 71 | 0.23 | 7.7 | 0.30 | 52 | 5.9 | 1.05 | 0.04 |
| Mar-86 | 0 | 0 | 193 | 28 | 0.07 | 5.8 | 0.22 | 35 | 2.3 | 1.05 | 0.04 |
| Apr-86 | 0 | 0 | 228 | 37 | 0.11 | 4.2 | 0.15 | 32 | 2.8 | 1.06 | 0.04 |
| ***May-86*** | 290 | 0 | 238 | 40 | 0.11 | 3.4 | 0.11 | 34 | 2.9 | 1.06 | 0.04 |
| Jun-86 | 0 | 0 | 248 | 42 | 0.12 | 3.0 | 0.10 | 31 | 2.9 | 1.06 | 0.04 |
| ***Jul-86*** | 1837 | 1535 | 261 | 46 | 0.14 | 6.1 | 0.23 | 52 | 3.8 | 1.09 | 0.04 |
| Aug-86 | 0 | 0 | 267 | 47 | 0.14 | 3.0 | 0.10 | 32 | 3.3 | 1.10 | 0.05 |
| Sep-86 | 0 | 0 | 444 | 95 | 0.21 | 2.3 | 0.07 | 32 | 5.3 | 1.11 | 0.05 |

Table 2B-9 Monthly Average Water Quality at
Rock Slough: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 473 | 103 | 0.34 | 2.1 | 0.06 | 28 | 5.5 | 1.13 | 0.05 |
| Nov-86 | 0 | 0 | 532 | 119 | 0.40 | 2.2 | 0.06 | 28 | 6.2 | 1.16 | 0.05 |
| Dec-86 | 0 | 0 | 759 | 180 | 0.62 | 2.2 | 0.06 | 33 | ***8.6*** | 1.20 | 0.05 |
| Jan-87 | 0 | 0 | 724 | 170 | 0.58 | 2.4 | 0.07 | 31 | ***8.5*** | 1.24 | 0.04 |
| Feb-87 | 0 | 0 | 701 | 164 | 0.56 | 3.2 | 0.11 | 46 | ***9.0*** | 1.28 | 0.04 |
| Mar-87 | 0 | 0 | 321 | 62 | 0.19 | 4.5 | 0.16 | 35 | 4.5 | 1.30 | 0.04 |
| Apr-87 | 0 | 0 | 248 | 43 | 0.12 | 4.3 | 0.15 | 34 | 3.2 | 1.31 | 0.04 |
| ***May-87*** | 414 | 0 | 294 | 55 | 0.17 | 3.1 | 0.10 | 34 | 3.7 | 1.31 | 0.04 |
| ***Jun-87*** | 517 | 0 | 272 | 49 | 0.15 | 2.4 | 0.07 | 26 | 3.1 | 1.31 | 0.04 |
| ***Jul-87*** | 54 | 5 | 316 | 61 | 0.19 | 2.2 | 0.06 | 26 | 3.7 | 1.31 | 0.04 |
| Aug-87 | 0 | 0 | 454 | 98 | 0.32 | 2.2 | 0.06 | 31 | 5.4 | 1.33 | 0.04 |
| Sep-87 | 0 | 0 | 528 | 118 | 0.39 | 2.2 | 0.06 | 34 | 6.2 | 1.36 | 0.04 |
| Oct-87 | 0 | 0 | 725 | 170 | 0.58 | 2.2 | 0.06 | 42 | ***8.3*** | 1.36 | 0.04 |
| Nov-87 | 0 | 0 | 700 | 164 | 0.56 | 2.2 | 0.06 | 35 | ***8.0*** | 1.32 | 0.04 |
| Dec-87 | 0 | 0 | 803 | 191 | 0.66 | 2.8 | 0.09 | 43 | ***8.7*** | 1.29 | 0.04 |
| Jan-88 | 0 | 0 | 650 | 150 | 0.51 | 4.7 | 0.17 | 45 | ***8.1*** | 1.31 | 0.04 |
| ***Feb-88*** | 139 | 0 | 333 | 65 | 0.21 | 4.7 | 0.17 | 33 | 4.7 | 1.32 | 0.04 |
| Mar-88 | 0 | 0 | 293 | 55 | 0.17 | 3.2 | 0.10 | 28 | 3.7 | 1.32 | 0.04 |
| Apr-88 | 0 | 0 | 305 | 58 | 0.18 | 2.9 | 0.09 | 30 | 3.8 | 1.32 | 0.04 |
| May-88 | 0 | 0 | 340 | 67 | 0.21 | 3.3 | 0.11 | 38 | 4.5 | 1.32 | 0.04 |
| Jun-88 | 0 | 0 | 380 | 78 | 0.25 | 3.0 | 0.09 | 38 | 4.9 | 1.32 | 0.04 |
| Jul-88 | 0 | 0 | 387 | 80 | 0.26 | 2.7 | 0.08 | 35 | 4.9 | 1.32 | 0.04 |
| Aug-88 | 0 | 0 | 526 | 117 | 0.39 | 2.7 | 0.08 | 43 | 6.6 | 1.29 | 0.04 |
| Sep-88 | 0 | 0 | 681 | 159 | 0.54 | 2.5 | 0.07 | 47 | ***8.1*** | 1.25 | 0.04 |
| Oct-88 | 0 | 0 | 818 | 195 | 0.67 | 2.3 | 0.07 | 49 | ***9.4*** | 1.21 | 0.04 |
| Nov-88 | 0 | 0 | 865 | 208 | 0.72 | 2.3 | 0.07 | 45 | ***9.8*** | 1.22 | 0.04 |
| Dec-88 | 0 | 0 | 829 | 198 | 0.68 | 2.2 | 0.06 | 36 | ***9.3*** | 1.24 | 0.04 |
| Jan-89 | 0 | 0 | 779 | 185 | 0.64 | 2.4 | 0.07 | 32 | ***9.0*** | 1.26 | 0.04 |
| Feb-89 | 0 | 0 | 570 | 129 | 0.43 | 2.7 | 0.08 | 33 | 7.1 | 1.27 | 0.04 |
| Mar-89 | 0 | 0 | 355 | 71 | 0.23 | 4.3 | 0.15 | 36 | 4.9 | 1.29 | 0.04 |
| Apr-89 | 0 | 0 | 233 | 38 | 0.11 | 5.1 | 0.19 | 38 | 3.0 | 1.30 | 0.04 |
| May-89 | 0 | 0 | 244 | 41 | 0.12 | 4.1 | 0.14 | 35 | 3.0 | 1.31 | 0.04 |
| ***Jun-89*** | 60 | 0 | 251 | 43 | 0.13 | 2.6 | 0.08 | 27 | 2.9 | 1.31 | 0.04 |
| ***Jul-89*** | 105 | 0 | 377 | 77 | 0.25 | 2.4 | 0.07 | 30 | 4.5 | 1.31 | 0.04 |
| Aug-89 | 0 | 0 | 428 | 91 | 0.30 | 2.2 | 0.06 | 31 | 5.1 | 1.36 | 0.04 |
| Sep-89 | 0 | 0 | 583 | 132 | 0.45 | 2.1 | 0.06 | 36 | 6.7 | 1.43 | 0.04 |
| Oct-89 | 0 | 0 | 709 | 166 | 0.57 | 2.1 | 0.06 | 39 | ***8.0*** | 1.45 | 0.04 |
| Nov-89 | 0 | 0 | 648 | 150 | 0.51 | 2.3 | 0.06 | 34 | 7.5 | 1.47 | 0.04 |
| Dec-89 | 0 | 0 | 674 | 157 | 0.53 | 2.4 | 0.07 | 32 | 8.0 | 1.48 | 0.04 |
| Jan-90 | 0 | 0 | 827 | 198 | 0.68 | 3.3 | 0.11 | 47 | ***10.5*** | 1.48 | 0.04 |
| Feb-90 | 0 | 0 | 584 | 133 | 0.45 | 4.1 | 0.14 | 42 | 7.9 | 1.48 | 0.04 |
| Mar-90 | 0 | 0 | 321 | 62 | 0.19 | 3.5 | 0.12 | 32 | 4.3 | 1.48 | 0.04 |
| Apr-90 | 0 | 0 | 321 | 62 | 0.19 | 3.4 | 0.11 | 36 | 4.3 | 1.49 | 0.04 |
| May-90 | 0 | 0 | 350 | 70 | 0.22 | 3.9 | 0.13 | 46 | 4.9 | 1.49 | 0.04 |
| Jun-90 | 0 | 0 | 376 | 77 | 0.25 | 2.9 | 0.09 | 37 | 4.8 | 1.50 | 0.04 |
| Jul-90 | 0 | 0 | 426 | 90 | 0.30 | 2.8 | 0.09 | 39 | 5.4 | 1.49 | 0.04 |
| Aug-90 | 0 | 0 | 570 | 129 | 0.43 | 2.9 | 0.09 | 49 | 7.2 | 1.50 | 0.04 |
| Sep-90 | 0 | 0 | 651 | 151 | 0.51 | 2.5 | 0.08 | 47 | 7.9 | 1.49 | 0.04 |
| Oct-90 | 0 | 0 | 933 | ***226*** | 0.78 | 2.4 | 0.07 | 57 | ***10.5*** | 1.48 | 0.04 |
| Nov-90 | 0 | 0 | 738 | 174 | 0.60 | 2.3 | 0.07 | 39 | ***8.5*** | 1.53 | 0.04 |
| Dec-90 | 0 | 0 | 629 | 145 | 0.49 | 2.3 | 0.07 | 29 | 7.4 | 1.58 | 0.04 |
| Jan-91 | 0 | 0 | 871 | 210 | 0.72 | 2.8 | 0.09 | 43 | ***10.4*** | 1.59 | 0.04 |
| Feb-91 | 0 | 0 | 853 | 205 | 0.71 | 2.9 | 0.09 | 50 | ***10.4*** | 1.61 | 0.04 |
| Mar-91 | 0 | 0 | 468 | 101 | 0.34 | 4.2 | 0.15 | 41 | 6.5 | 1.67 | 0.04 |
| Apr-91 | 0 | 0 | 268 | 48 | 0.14 | 4.9 | 0.18 | 40 | 3.6 | 1.70 | 0.04 |
| May-91 | 0 | 0 | 296 | 55 | 0.17 | 3.7 | 0.13 | 40 | 4.0 | 1.72 | 0.04 |
| Jun-91 | 0 | 0 | 361 | 73 | 0.23 | 2.9 | 0.09 | 36 | 4.6 | 1.71 | 0.04 |
| Jul-91 | 0 | 0 | 411 | 86 | 0.28 | 2.8 | 0.09 | 38 | 5.2 | 1.70 | 0.04 |
| Aug-91 | 0 | 0 | 584 | 132 | 0.45 | 2.9 | 0.09 | 50 | 7.4 | 1.74 | 0.04 |
| Sep-91 | 0 | 0 | 701 | 164 | 0.56 | 2.6 | 0.08 | 50 | ***8.4*** | 1.76 | 0.04 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-10 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 538 | 103 | 0.34 | 2.2 | 0.05 | 29 | 5.6 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 403 | 66 | 0.21 | 2.5 | 0.07 | 24 | 4.1 | n/a | n/a |
| Dec-75 | 0 | 0 | 647 | 133 | 0.45 | 2.9 | 0.09 | 34 | 7.4 | n/a | n/a |
| Jan-76 | 0 | 0 | 668 | 139 | 0.46 | 3.1 | 0.10 | 34 | 7.9 | n/a | n/a |
| Feb-76 | 0 | 0 | 681 | 142 | 0.47 | 3.1 | 0.10 | 40 | ***8.0*** | n/a | n/a |
| Mar-76 | 0 | 0 | 476 | 86 | 0.27 | 3.0 | 0.09 | 31 | 5.3 | n/a | n/a |
| Apr-76 | 0 | 0 | 408 | 68 | 0.19 | 3.2 | 0.09 | 33 | 4.4 | n/a | n/a |
| May-76 | 0 | 0 | 406 | 67 | 0.21 | 3.1 | 0.09 | 36 | 4.4 | n/a | n/a |
| Jun-76 | 0 | 0 | 404 | 66 | 0.21 | 2.9 | 0.07 | 34 | 4.3 | n/a | n/a |
| Jul-76 | 0 | 0 | 425 | 72 | 0.23 | 2.7 | 0.07 | 34 | 4.5 | n/a | n/a |
| Aug-76 | 0 | 0 | 546 | 105 | 0.34 | 2.7 | 0.07 | 39 | 6.0 | n/a | n/a |
| Sep-76 | 0 | 0 | 535 | 102 | 0.36 | 2.5 | 0.06 | 37 | 5.8 | n/a | n/a |
| Oct-76 | 0 | 0 | 743 | 159 | 0.57 | 2.7 | 0.07 | 49 | ***8.3*** | n/a | n/a |
| Nov-76 | 0 | 0 | 714 | 151 | 0.51 | 2.8 | 0.07 | 42 | ***8.2*** | n/a | n/a |
| Dec-76 | 0 | 0 | 545 | 105 | 0.33 | 2.8 | 0.07 | 28 | 6.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 747 | 160 | 0.58 | 2.9 | 0.09 | 37 | ***8.6*** | n/a | n/a |
| Feb-77 | 0 | 0 | 799 | 175 | 0.61 | 3.6 | 0.13 | 55 | ***9.8*** | n/a | n/a |
| Mar-77 | 0 | 0 | 728 | 155 | 0.73 | 4.1 | 0.18 | ***68*** | ***9.0*** | n/a | n/a |
| Apr-77 | 0 | 0 | 520 | 98 | 0.45 | 3.6 | 0.12 | 56 | 6.3 | n/a | n/a |
| May-77 | 0 | 0 | 509 | 95 | 0.34 | 3.3 | 0.09 | 47 | 5.9 | n/a | n/a |
| Jun-77 | 0 | 0 | 573 | 113 | 0.37 | 3.3 | 0.09 | 51 | 6.8 | n/a | n/a |
| Jul-77 | 0 | 0 | 540 | 104 | 0.35 | 3.3 | 0.08 | 49 | 6.4 | n/a | n/a |
| Aug-77 | 0 | 0 | 461 | 82 | 0.26 | 3.2 | 0.08 | 42 | 5.2 | n/a | n/a |
| Sep-77 | 0 | 0 | 651 | 134 | 0.48 | 2.9 | 0.07 | 51 | 7.5 | n/a | n/a |
| Oct-77 | 0 | 0 | 842 | 186 | 0.68 | 2.8 | 0.07 | 61 | ***9.6*** | n/a | n/a |
| Nov-77 | 0 | 0 | 783 | 170 | 0.57 | 2.8 | 0.08 | 46 | ***8.9*** | n/a | n/a |
| Dec-77 | 0 | 0 | 883 | 197 | 0.65 | 2.9 | 0.09 | 45 | ***10.1*** | n/a | n/a |
| Jan-78 | 0 | 0 | 546 | 105 | 0.25 | 5.6 | 0.20 | 42 | 7.2 | n/a | n/a |
| Feb-78 | 0 | 0 | 355 | 53 | 0.15 | 7.2 | 0.26 | 44 | 4.5 | n/a | n/a |
| Mar-78 | 0 | 0 | 353 | 52 | 0.16 | 6.8 | 0.24 | 47 | 4.4 | n/a | n/a |
| Apr-78 | 0 | 0 | 309 | 41 | 0.11 | 4.4 | 0.15 | 34 | 3.0 | n/a | n/a |
| May-78 | 0 | 0 | 228 | 18 | 0.04 | 3.6 | 0.11 | 31 | 1.3 | n/a | n/a |
| Jun-78 | 0 | 0 | 235 | 20 | 0.04 | 3.4 | 0.10 | 30 | 1.4 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 282 | 33 | 0.09 | 6.3 | 0.31 | 48 | 2.8 | n/a | n/a |
| Aug-78 | 0 | 0 | 334 | 47 | 0.14 | 3.1 | 0.09 | 33 | 3.3 | n/a | n/a |
| Sep-78 | 0 | 0 | 535 | 102 | 0.34 | 2.5 | 0.06 | 36 | 5.6 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 593 | 118 | 0.43 | 2.5 | 0.06 | 38 | 6.4 | n/a | n/a |
| Nov-78 | 0 | 0 | 565 | 111 | 0.39 | 2.5 | 0.06 | 32 | 6.2 | n/a | n/a |
| Dec-78 | 0 | 0 | 728 | 155 | 0.54 | 2.4 | 0.07 | 32 | 7.9 | n/a | n/a |
| Jan-79 | 0 | 0 | 615 | 124 | 0.41 | 3.4 | 0.11 | 35 | 7.4 | n/a | n/a |
| Feb-79 | 0 | 0 | 390 | 63 | 0.18 | 5.0 | 0.18 | 34 | 4.6 | n/a | n/a |
| Mar-79 | 0 | 0 | 296 | 37 | 0.09 | 5.0 | 0.17 | 32 | 2.9 | n/a | n/a |
| Apr-79 | 0 | 0 | 281 | 33 | 0.09 | 3.5 | 0.10 | 31 | 2.4 | n/a | n/a |
| May-79 | 0 | 0 | 276 | 31 | 0.08 | 3.2 | 0.10 | 30 | 2.3 | n/a | n/a |
| ***Jun-79*** | 350 | 0 | 275 | 31 | 0.08 | 3.3 | 0.08 | 32 | 2.3 | n/a | n/a |
| ***Jul-79*** | 1415 | 1558 | 286 | 34 | 0.10 | 5.3 | 0.26 | 42 | 2.8 | n/a | n/a |
| Aug-79 | 0 | 0 | 369 | 57 | 0.17 | 2.8 | 0.08 | 32 | 3.7 | n/a | n/a |
| Sep-79 | 0 | 0 | 578 | 114 | 0.38 | 2.5 | 0.06 | 38 | 6.3 | n/a | n/a |
| Oct-79 | 0 | 0 | 749 | 161 | 0.56 | 2.4 | 0.06 | 44 | ***8.1*** | n/a | n/a |
| Nov-79 | 0 | 0 | 595 | 119 | 0.39 | 2.4 | 0.06 | 30 | 6.4 | n/a | n/a |
| Dec-79 | 0 | 0 | 547 | 106 | 0.28 | 2.6 | 0.08 | 25 | 6.0 | n/a | n/a |
| Jan-80 | 0 | 0 | 469 | 84 | 0.24 | 5.0 | 0.19 | 33 | 5.9 | n/a | n/a |
| Feb-80 | 0 | 0 | 308 | 40 | 0.11 | 6.2 | 0.28 | 35 | 3.4 | n/a | n/a |
| Mar-80 | 0 | 0 | 208 | 13 | 0.01 | 4.4 | 0.16 | 24 | 0.8 | n/a | n/a |
| Apr-80 | 0 | 0 | 270 | 30 | 0.07 | 3.6 | 0.10 | 30 | 2.2 | n/a | n/a |
| May-80 | 0 | 0 | 263 | 28 | 0.07 | 3.0 | 0.09 | 28 | 2.0 | n/a | n/a |
| Jun-80 | 0 | 0 | 264 | 28 | 0.07 | 3.1 | 0.09 | 29 | 2.0 | n/a | n/a |
| ***Jul-80*** | 1844 | 1601 | 282 | 33 | 0.09 | 6.4 | 0.33 | 49 | 2.8 | n/a | n/a |
| Aug-80 | 0 | 0 | 313 | 42 | 0.12 | 3.2 | 0.11 | 33 | 2.9 | n/a | n/a |
| Sep-80 | 0 | 0 | 474 | 86 | 0.28 | 2.5 | 0.06 | 32 | 5.0 | n/a | n/a |
| ***Oct-80*** | 49 | 0 | 545 | 105 | 0.37 | 2.5 | 0.06 | 36 | 5.9 | n/a | n/a |
| Nov-80 | 0 | 0 | 505 | 94 | 0.33 | 2.5 | 0.06 | 29 | 5.4 | n/a | n/a |
| Dec-80 | 0 | 0 | 612 | 123 | 0.45 | 2.5 | 0.07 | 29 | 6.7 | n/a | n/a |
| Jan-81 | 0 | 0 | 708 | 150 | 0.51 | 2.9 | 0.09 | 34 | ***8.1*** | n/a | n/a |
| Feb-81 | 0 | 0 | 442 | 77 | 0.22 | 3.3 | 0.11 | 29 | 5.0 | n/a | n/a |
| Mar-81 | 0 | 0 | 304 | 39 | 0.10 | 3.7 | 0.12 | 28 | 2.9 | n/a | n/a |

Table 2B-10 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 286 | 34 | 0.09 | 3.3 | 0.10 | 29 | 2.5 | n/a | n/a |
| ***May-81*** | 19 | 0 | 348 | 51 | 0.15 | 3.2 | 0.10 | 34 | 3.6 | n/a | n/a |
| ***Jun-81*** | 439 | 0 | 319 | 43 | 0.17 | 3.1 | 0.09 | 34 | 3.0 | n/a | n/a |
| ***Jul-81*** | 664 | 283 | 327 | 46 | 0.17 | 3.3 | 0.10 | 37 | 3.2 | n/a | n/a |
| Aug-81 | 0 | 0 | 492 | 91 | 0.26 | 2.4 | 0.06 | 31 | 5.2 | n/a | n/a |
| Sep-81 | 0 | 0 | 614 | 124 | 0.36 | 2.4 | 0.06 | 35 | 6.6 | n/a | n/a |
| Oct-81 | 0 | 0 | 765 | 165 | 0.51 | 2.4 | 0.06 | 42 | ***8.3*** | n/a | n/a |
| Nov-81 | 0 | 0 | 722 | 153 | 0.48 | 2.8 | 0.08 | 40 | ***8.2*** | n/a | n/a |
| Dec-81 | 0 | 0 | 350 | 52 | 0.12 | 4.7 | 0.18 | 28 | 3.9 | n/a | n/a |
| Jan-82 | 0 | 0 | 348 | 51 | 0.15 | 5.7 | 0.18 | 31 | 4.1 | n/a | n/a |
| Feb-82 | 0 | 0 | 319 | 43 | 0.12 | 5.7 | 0.21 | 34 | 3.5 | n/a | n/a |
| Mar-82 | 0 | 0 | 370 | 57 | 0.16 | 5.4 | 0.23 | 39 | 4.4 | n/a | n/a |
| Apr-82 | 0 | 0 | 208 | 13 | 0.01 | 4.3 | 0.17 | 28 | 0.8 | n/a | n/a |
| May-82 | 0 | 0 | 195 | 10 | 0.01 | 3.9 | 0.12 | 31 | 0.3 | n/a | n/a |
| Jun-82 | 0 | 0 | 233 | 20 | 0.04 | 3.2 | 0.09 | 28 | 1.4 | n/a | n/a |
| ***Jul-82*** | 1836 | 1613 | 276 | 32 | 0.08 | 6.8 | 0.35 | 57 | 2.8 | n/a | n/a |
| Aug-82 | 0 | 0 | 341 | 49 | 0.15 | 3.3 | 0.12 | 35 | 3.4 | n/a | n/a |
| Sep-82 | 0 | 0 | 405 | 69 | 0.29 | 2.4 | 0.06 | 31 | 5.1 | n/a | n/a |
| Oct-82 | 0 | 0 | 300 | 38 | 0.11 | 2.6 | 0.07 | 24 | 2.6 | n/a | n/a |
| Nov-82 | 0 | 0 | 243 | 23 | 0.05 | 3.2 | 0.11 | 23 | 1.6 | n/a | n/a |
| Dec-82 | 0 | 0 | 259 | 27 | 0.07 | 3.9 | 0.16 | 24 | 2.1 | n/a | n/a |
| Jan-83 | 0 | 0 | 229 | 19 | 0.04 | 4.1 | 0.17 | 19 | 1.3 | n/a | n/a |
| Feb-83 | 0 | 0 | 126 | 10 | 0.01 | 4.8 | 0.18 | 24 | 0.5 | n/a | n/a |
| Mar-83 | 0 | 0 | 162 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | n/a | n/a |
| Apr-83 | 0 | 0 | 221 | 17 | 0.03 | 5.3 | 0.20 | 34 | 1.2 | n/a | n/a |
| May-83 | 0 | 0 | 236 | 21 | 0.04 | 5.2 | 0.18 | 37 | 1.6 | n/a | n/a |
| Jun-83 | 0 | 0 | 151 | 10 | 0.01 | 3.7 | 0.12 | 30 | 0.5 | n/a | n/a |
| Jul-83 | 0 | 0 | 186 | 10 | 0.01 | 3.3 | 0.10 | 28 | 0.5 | n/a | n/a |
| Aug-83 | 0 | 0 | 260 | 27 | 0.07 | 2.6 | 0.07 | 24 | 1.8 | n/a | n/a |
| Sep-83 | 0 | 0 | 327 | 46 | 0.14 | 2.5 | 0.06 | 25 | 2.9 | n/a | n/a |
| Oct-83 | 0 | 0 | 254 | 26 | 0.06 | 2.9 | 0.08 | 25 | 1.8 | n/a | n/a |
| Nov-83 | 0 | 0 | 218 | 16 | 0.02 | 3.4 | 0.12 | 23 | 1.0 | n/a | n/a |
| Dec-83 | 0 | 0 | 139 | 10 | 0.01 | 3.9 | 0.14 | 22 | 0.5 | n/a | n/a |
| Jan-84 | 0 | 0 | 194 | 10 | 0.01 | 4.5 | 0.18 | 19 | 0.3 | n/a | n/a |
| Feb-84 | 0 | 0 | 265 | 29 | 0.06 | 3.9 | 0.13 | 25 | 2.2 | n/a | n/a |
| Mar-84 | 0 | 0 | 276 | 31 | 0.07 | 3.0 | 0.09 | 22 | 2.2 | n/a | n/a |
| ***Apr-84*** | 188 | 0 | 284 | 34 | 0.09 | 2.9 | 0.07 | 26 | 2.4 | n/a | n/a |
| May-84 | 0 | 0 | 326 | 45 | 0.13 | 2.8 | 0.08 | 28 | 3.0 | n/a | n/a |
| ***Jun-84*** | 731 | 0 | 311 | 41 | 0.13 | 3.5 | 0.08 | 38 | 3.0 | n/a | n/a |
| ***Jul-84*** | 873 | 1535 | 265 | 29 | 0.09 | 5.2 | 0.26 | 47 | 2.3 | n/a | n/a |
| Aug-84 | 0 | 0 | 293 | 36 | 0.13 | 2.7 | 0.09 | 28 | 2.4 | n/a | n/a |
| Sep-84 | 0 | 0 | 477 | 86 | 0.31 | 2.4 | 0.06 | 33 | 5.0 | n/a | n/a |
| Oct-84 | 0 | 0 | 621 | 126 | 0.45 | 2.4 | 0.06 | 38 | 6.7 | n/a | n/a |
| Nov-84 | 0 | 0 | 630 | 128 | 0.49 | 2.7 | 0.08 | 39 | 7.1 | n/a | n/a |
| Dec-84 | 0 | 0 | 377 | 59 | 0.17 | 3.6 | 0.12 | 27 | 4.1 | n/a | n/a |
| ***Jan-85*** | 399 | 0 | 371 | 58 | 0.16 | 3.9 | 0.13 | 26 | 4.2 | n/a | n/a |
| ***Feb-85*** | 61 | 0 | 433 | 74 | 0.22 | 3.7 | 0.12 | 32 | 5.1 | n/a | n/a |
| Mar-85 | 0 | 0 | 375 | 58 | 0.17 | 3.6 | 0.12 | 32 | 4.1 | n/a | n/a |
| Apr-85 | 0 | 0 | 361 | 55 | 0.16 | 3.6 | 0.11 | 37 | 3.9 | n/a | n/a |
| May-85 | 0 | 0 | 367 | 56 | 0.18 | 3.2 | 0.10 | 35 | 3.8 | n/a | n/a |
| Jun-85 | 0 | 0 | 303 | 39 | 0.11 | 2.7 | 0.07 | 28 | 2.6 | n/a | n/a |
| ***Jul-85*** | 38 | 0 | 371 | 57 | 0.18 | 2.4 | 0.06 | 28 | 3.6 | n/a | n/a |
| Aug-85 | 0 | 0 | 550 | 106 | 0.34 | 2.3 | 0.06 | 34 | 5.8 | n/a | n/a |
| Sep-85 | 0 | 0 | 542 | 104 | 0.34 | 2.3 | 0.05 | 33 | 5.7 | n/a | n/a |
| Oct-85 | 0 | 0 | 683 | 143 | 0.49 | 2.5 | 0.06 | 41 | 7.5 | n/a | n/a |
| Nov-85 | 0 | 0 | 662 | 137 | 0.49 | 2.6 | 0.06 | 38 | 7.4 | n/a | n/a |
| Dec-85 | 0 | 0 | 599 | 120 | 0.41 | 3.2 | 0.10 | 36 | 7.1 | n/a | n/a |
| Jan-86 | 0 | 0 | 585 | 110 | 0.36 | 4.6 | 0.17 | 36 | 7.1 | n/a | n/a |
| Feb-86 | 0 | 0 | 389 | 62 | 0.18 | 8.2 | 0.31 | 51 | 5.4 | n/a | n/a |
| Mar-86 | 0 | 0 | 192 | 10 | 0.01 | 5.3 | 0.23 | 29 | 0.5 | n/a | n/a |
| Apr-86 | 0 | 0 | 234 | 20 | 0.04 | 4.2 | 0.15 | 29 | 1.5 | n/a | n/a |
| ***May-86*** | 290 | 0 | 252 | 25 | 0.06 | 3.8 | 0.12 | 34 | 1.9 | n/a | n/a |
| Jun-86 | 0 | 0 | 265 | 28 | 0.07 | 3.2 | 0.10 | 30 | 2.1 | n/a | n/a |
| ***Jul-86*** | 1837 | 1535 | 302 | 39 | 0.12 | 7.4 | 0.35 | 59 | 3.4 | n/a | n/a |
| Aug-86 | 0 | 0 | 335 | 48 | 0.14 | 3.6 | 0.11 | 38 | 3.4 | n/a | n/a |
| Sep-86 | 0 | 0 | 445 | 78 | 0.27 | 2.6 | 0.07 | 34 | 4.7 | n/a | n/a |

Table 2B-10 Monthly Average Water Quality at
Los Vaqueros Reservoir Intake: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 480 | 87 | 0.42 | 2.4 | 0.06 | 36 | 5.0 | n/a | n/a |
| Nov-86 | 0 | 0 | 510 | 96 | 0.38 | 2.5 | 0.06 | 31 | 5.5 | n/a | n/a |
| Dec-86 | 0 | 0 | 670 | 139 | 0.51 | 2.5 | 0.07 | 32 | 7.4 | n/a | n/a |
| Jan-87 | 0 | 0 | 671 | 139 | 0.48 | 2.8 | 0.09 | 32 | 7.7 | n/a | n/a |
| Feb-87 | 0 | 0 | 694 | 146 | 0.42 | 3.6 | 0.13 | 42 | ***8.6*** | n/a | n/a |
| Mar-87 | 0 | 0 | 395 | 64 | 0.17 | 5.0 | 0.18 | 36 | 4.7 | n/a | n/a |
| Apr-87 | 0 | 0 | 311 | 41 | 0.11 | 5.0 | 0.16 | 38 | 3.2 | n/a | n/a |
| ***May-87*** | 414 | 0 | 367 | 56 | 0.17 | 3.9 | 0.10 | 42 | 4.1 | n/a | n/a |
| ***Jun-87*** | 517 | 0 | 322 | 44 | 0.18 | 3.3 | 0.09 | 37 | 3.1 | n/a | n/a |
| ***Jul-87*** | 54 | 5 | 322 | 44 | 0.23 | 2.6 | 0.07 | 32 | 2.9 | n/a | n/a |
| Aug-87 | 0 | 0 | 433 | 74 | 0.33 | 2.5 | 0.06 | 36 | 4.5 | n/a | n/a |
| Sep-87 | 0 | 0 | 500 | 93 | 0.35 | 2.5 | 0.06 | 37 | 5.4 | n/a | n/a |
| Oct-87 | 0 | 0 | 697 | 147 | 0.53 | 2.6 | 0.06 | 45 | 7.7 | n/a | n/a |
| Nov-87 | 0 | 0 | 664 | 137 | 0.47 | 2.6 | 0.07 | 37 | 7.4 | n/a | n/a |
| Dec-87 | 0 | 0 | 726 | 154 | 0.55 | 3.0 | 0.09 | 40 | ***8.4*** | n/a | n/a |
| Jan-88 | 0 | 0 | 635 | 130 | 0.44 | 4.6 | 0.18 | 42 | ***8.2*** | n/a | n/a |
| ***Feb-88*** | 139 | 0 | 391 | 63 | 0.18 | 5.6 | 0.20 | 37 | 4.8 | n/a | n/a |
| Mar-88 | 0 | 0 | 369 | 57 | 0.15 | 4.4 | 0.14 | 32 | 4.1 | n/a | n/a |
| Apr-88 | 0 | 0 | 373 | 58 | 0.16 | 3.8 | 0.10 | 38 | 4.1 | n/a | n/a |
| May-88 | 0 | 0 | 421 | 71 | 0.21 | 4.1 | 0.11 | 41 | 4.8 | n/a | n/a |
| Jun-88 | 0 | 0 | 443 | 77 | 0.23 | 3.8 | 0.09 | 47 | 5.3 | n/a | n/a |
| Jul-88 | 0 | 0 | 416 | 70 | 0.23 | 3.4 | 0.08 | 41 | 4.7 | n/a | n/a |
| Aug-88 | 0 | 0 | 506 | 94 | 0.32 | 3.4 | 0.09 | 47 | 6.0 | n/a | n/a |
| Sep-88 | 0 | 0 | 617 | 125 | 0.43 | 2.9 | 0.07 | 48 | 7.1 | n/a | n/a |
| Oct-88 | 0 | 0 | 768 | 166 | 0.58 | 2.7 | 0.07 | 52 | ***8.7*** | n/a | n/a |
| Nov-88 | 0 | 0 | 782 | 170 | 0.59 | 2.7 | 0.07 | 45 | ***8.8*** | n/a | n/a |
| Dec-88 | 0 | 0 | 758 | 163 | 0.54 | 2.6 | 0.07 | 35 | ***8.4*** | n/a | n/a |
| Jan-89 | 0 | 0 | 748 | 160 | 0.54 | 2.8 | 0.09 | 33 | ***8.5*** | n/a | n/a |
| Feb-89 | 0 | 0 | 610 | 123 | 0.40 | 3.4 | 0.13 | 39 | 7.4 | n/a | n/a |
| Mar-89 | 0 | 0 | 397 | 65 | 0.20 | 4.6 | 0.17 | 36 | 4.6 | n/a | n/a |
| Apr-89 | 0 | 0 | 259 | 27 | 0.06 | 5.4 | 0.19 | 37 | 2.2 | n/a | n/a |
| May-89 | 0 | 0 | 312 | 41 | 0.12 | 4.7 | 0.15 | 39 | 3.2 | n/a | n/a |
| ***Jun-89*** | 60 | 0 | 265 | 34 | 0.09 | 3.2 | 0.08 | 31 | 2.4 | n/a | n/a |
| ***Jul-89*** | 105 | 0 | 370 | 57 | 0.19 | 2.6 | 0.07 | 33 | 3.6 | n/a | n/a |
| Aug-89 | 0 | 0 | 410 | 68 | 0.24 | 2.5 | 0.06 | 32 | 4.2 | n/a | n/a |
| Sep-89 | 0 | 0 | 535 | 102 | 0.37 | 2.4 | 0.06 | 36 | 5.7 | n/a | n/a |
| Oct-89 | 0 | 0 | 673 | 140 | 0.53 | 2.4 | 0.06 | 43 | 7.3 | n/a | n/a |
| Nov-89 | 0 | 0 | 636 | 130 | 0.45 | 2.6 | 0.07 | 36 | 7.1 | n/a | n/a |
| Dec-89 | 0 | 0 | 626 | 127 | 0.43 | 2.8 | 0.08 | 33 | 7.1 | n/a | n/a |
| Jan-90 | 0 | 0 | 739 | 158 | 0.57 | 3.5 | 0.12 | 43 | ***9.0*** | n/a | n/a |
| Feb-90 | 0 | 0 | 626 | 127 | 0.41 | 4.6 | 0.17 | 45 | 8.0 | n/a | n/a |
| Mar-90 | 0 | 0 | 389 | 62 | 0.18 | 4.4 | 0.14 | 33 | 4.4 | n/a | n/a |
| Apr-90 | 0 | 0 | 406 | 67 | 0.20 | 4.3 | 0.13 | 39 | 4.7 | n/a | n/a |
| May-90 | 0 | 0 | 418 | 70 | 0.22 | 4.5 | 0.14 | 44 | 4.9 | n/a | n/a |
| Jun-90 | 0 | 0 | 420 | 71 | 0.23 | 3.6 | 0.09 | 44 | 4.8 | n/a | n/a |
| Jul-90 | 0 | 0 | 445 | 78 | 0.25 | 3.6 | 0.09 | 45 | 5.2 | n/a | n/a |
| Aug-90 | 0 | 0 | 537 | 103 | 0.34 | 3.6 | 0.09 | 52 | 6.5 | n/a | n/a |
| Sep-90 | 0 | 0 | 598 | 119 | 0.42 | 3.1 | 0.07 | 49 | 7.0 | n/a | n/a |
| Oct-90 | 0 | 0 | 824 | 181 | 0.67 | 2.8 | 0.07 | 59 | ***9.4*** | n/a | n/a |
| Nov-90 | 0 | 0 | 739 | 158 | 0.55 | 2.8 | 0.07 | 44 | ***8.4*** | n/a | n/a |
| Dec-90 | 0 | 0 | 602 | 121 | 0.40 | 2.7 | 0.08 | 30 | 6.8 | n/a | n/a |
| Jan-91 | 0 | 0 | 744 | 159 | 0.45 | 3.4 | 0.12 | 36 | ***9.0*** | n/a | n/a |
| Feb-91 | 0 | 0 | 796 | 174 | 0.45 | 3.9 | 0.15 | 47 | ***10.0*** | n/a | n/a |
| Mar-91 | 0 | 0 | 514 | 97 | 0.27 | 4.5 | 0.17 | 40 | 6.4 | n/a | n/a |
| Apr-91 | 0 | 0 | 329 | 46 | 0.13 | 5.6 | 0.19 | 43 | 3.7 | n/a | n/a |
| May-91 | 0 | 0 | 346 | 51 | 0.15 | 4.4 | 0.13 | 39 | 3.7 | n/a | n/a |
| Jun-91 | 0 | 0 | 410 | 68 | 0.21 | 3.7 | 0.09 | 44 | 4.7 | n/a | n/a |
| Jul-91 | 0 | 0 | 445 | 78 | 0.25 | 3.6 | 0.09 | 46 | 5.2 | n/a | n/a |
| Aug-91 | 0 | 0 | 535 | 102 | 0.34 | 3.7 | 0.09 | 53 | 6.5 | n/a | n/a |
| Sep-91 | 0 | 0 | 623 | 126 | 0.43 | 3.1 | 0.08 | 50 | 7.3 | n/a | n/a |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-11 Monthly Average Water Quality at
Banks Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 505 | 94 | 0.31 | 2.4 | 0.07 | 30 | 5.3 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 393 | 64 | 0.20 | 2.6 | 0.08 | 25 | 4.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 595 | 119 | 0.40 | 3.1 | 0.10 | 34 | 6.9 | n/a | n/a |
| Jan-76 | 0 | 0 | 616 | 124 | 0.42 | 3.3 | 0.11 | 34 | 7.4 | n/a | n/a |
| Feb-76 | 0 | 0 | 673 | 140 | 0.47 | 3.3 | 0.11 | 41 | ***8.0*** | n/a | n/a |
| Mar-76 | 0 | 0 | 590 | 117 | 0.39 | 3.1 | 0.10 | 40 | 6.9 | n/a | n/a |
| Apr-76 | 0 | 0 | 544 | 105 | 0.35 | 3.1 | 0.10 | 42 | 6.3 | n/a | n/a |
| May-76 | 0 | 0 | 443 | 77 | 0.25 | 3.2 | 0.10 | 40 | 5.0 | n/a | n/a |
| Jun-76 | 0 | 0 | 418 | 70 | 0.22 | 3.1 | 0.10 | 38 | 4.6 | n/a | n/a |
| Jul-76 | 0 | 0 | 409 | 68 | 0.22 | 3.0 | 0.10 | 36 | 4.4 | n/a | n/a |
| Aug-76 | 0 | 0 | 502 | 93 | 0.31 | 2.9 | 0.09 | 41 | 5.7 | n/a | n/a |
| Sep-76 | 0 | 0 | 515 | 97 | 0.32 | 2.7 | 0.08 | 38 | 5.7 | n/a | n/a |
| Oct-76 | 0 | 0 | 692 | 145 | 0.49 | 2.9 | 0.09 | 49 | 8.0 | n/a | n/a |
| Nov-76 | 0 | 0 | 657 | 136 | 0.46 | 3.1 | 0.10 | 44 | 7.7 | n/a | n/a |
| Dec-76 | 0 | 0 | 555 | 108 | 0.36 | 3.6 | 0.12 | 37 | 6.7 | n/a | n/a |
| Jan-77 | 0 | 0 | 696 | 143 | 0.49 | 3.4 | 0.12 | 39 | ***8.3*** | n/a | n/a |
| Feb-77 | 0 | 0 | 772 | 167 | 0.57 | 3.9 | 0.14 | 56 | ***9.7*** | n/a | n/a |
| Mar-77 | 0 | 0 | 976 | 223 | 0.77 | 3.1 | 0.10 | 64 | ***11.3*** | n/a | n/a |
| Apr-77 | 0 | 0 | 639 | 131 | 0.44 | 3.6 | 0.12 | 55 | 7.8 | n/a | n/a |
| May-77 | 0 | 0 | 541 | 104 | 0.34 | 3.4 | 0.11 | 49 | 6.5 | n/a | n/a |
| Jun-77 | 0 | 0 | 568 | 111 | 0.37 | 3.4 | 0.11 | 52 | 6.8 | n/a | n/a |
| Jul-77 | 0 | 0 | 536 | 102 | 0.34 | 3.6 | 0.12 | 52 | 6.5 | n/a | n/a |
| Aug-77 | 0 | 0 | 465 | 83 | 0.27 | 3.5 | 0.12 | 45 | 5.4 | n/a | n/a |
| Sep-77 | 0 | 0 | 596 | 119 | 0.40 | 3.2 | 0.10 | 50 | 7.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 786 | 171 | 0.58 | 3.0 | 0.10 | 57 | ***9.2*** | n/a | n/a |
| Nov-77 | 0 | 0 | 749 | 161 | 0.55 | 3.0 | 0.10 | 47 | ***8.7*** | n/a | n/a |
| Dec-77 | 0 | 0 | 775 | 168 | 0.57 | 3.0 | 0.09 | 41 | ***9.0*** | n/a | n/a |
| Jan-78 | 0 | 0 | 536 | 102 | 0.34 | 6.3 | 0.24 | 46 | 7.4 | n/a | n/a |
| Feb-78 | 0 | 0 | 315 | 42 | 0.12 | 9.4 | 0.38 | 51 | 4.0 | n/a | n/a |
| Mar-78 | 0 | 0 | 336 | 48 | 0.14 | 5.3 | 0.20 | 37 | 3.7 | n/a | n/a |
| Apr-78 | 0 | 0 | 252 | 25 | 0.06 | 4.0 | 0.14 | 29 | 1.9 | n/a | n/a |
| May-78 | 0 | 0 | 229 | 19 | 0.04 | 3.6 | 0.13 | 32 | 1.4 | n/a | n/a |
| Jun-78 | 0 | 0 | 238 | 21 | 0.05 | 3.5 | 0.12 | 31 | 1.5 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 309 | 41 | 0.12 | 6.9 | 0.27 | 55 | 3.5 | n/a | n/a |
| Aug-78 | 0 | 0 | 351 | 52 | 0.16 | 3.3 | 0.11 | 36 | 3.6 | n/a | n/a |
| Sep-78 | 0 | 0 | 506 | 94 | 0.31 | 2.7 | 0.08 | 37 | 5.5 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 544 | 105 | 0.35 | 2.7 | 0.08 | 37 | 6.0 | 21.48 | 1.01 |
| Nov-78 | 0 | 0 | 509 | 95 | 0.31 | 2.8 | 0.09 | 31 | 5.6 | 20.70 | 0.99 |
| Dec-78 | 0 | 0 | 656 | 135 | 0.46 | 2.7 | 0.08 | 33 | 7.4 | 20.43 | 0.97 |
| Jan-79 | 0 | 0 | 531 | 101 | 0.33 | 3.8 | 0.13 | 34 | 6.5 | 20.18 | 0.95 |
| Feb-79 | 0 | 0 | 349 | 52 | 0.16 | 5.2 | 0.19 | 33 | 4.0 | 20.85 | 0.99 |
| Mar-79 | 0 | 0 | 308 | 40 | 0.12 | 5.6 | 0.21 | 37 | 3.3 | 20.84 | 1.05 |
| Apr-79 | 0 | 0 | 311 | 41 | 0.12 | 3.9 | 0.14 | 36 | 3.1 | 20.74 | 1.10 |
| May-79 | 0 | 0 | 288 | 35 | 0.10 | 3.3 | 0.11 | 31 | 2.5 | 20.91 | 1.13 |
| ***Jun-79*** | 350 | 0 | 302 | 39 | 0.11 | 3.9 | 0.13 | 38 | 2.9 | 20.97 | 1.14 |
| ***Jul-79*** | 1415 | 1558 | 301 | 38 | 0.11 | 5.7 | 0.21 | 46 | 3.2 | 20.94 | 1.16 |
| Aug-79 | 0 | 0 | 370 | 57 | 0.18 | 3.1 | 0.10 | 35 | 3.8 | 21.20 | 1.23 |
| Sep-79 | 0 | 0 | 533 | 102 | 0.34 | 2.7 | 0.08 | 38 | 5.9 | 21.19 | 1.24 |
| Oct-79 | 0 | 0 | 688 | 144 | 0.49 | 2.6 | 0.08 | 44 | 7.7 | 21.97 | 1.26 |
| Nov-79 | 0 | 0 | 563 | 110 | 0.37 | 2.5 | 0.07 | 31 | 6.1 | 22.35 | 1.26 |
| Dec-79 | 0 | 0 | 523 | 99 | 0.33 | 2.8 | 0.09 | 28 | 5.8 | 22.74 | 1.27 |
| Jan-80 | 0 | 0 | 321 | 44 | 0.13 | 6.2 | 0.24 | 32 | 3.6 | 23.61 | 1.29 |
| Feb-80 | 0 | 0 | 162 | 10 | 0.01 | 4.2 | 0.15 | 21 | 0.5 | 23.91 | 1.41 |
| Mar-80 | 0 | 0 | 226 | 18 | 0.04 | 4.3 | 0.15 | 25 | 1.3 | 23.74 | 1.45 |
| Apr-80 | 0 | 0 | 281 | 33 | 0.09 | 3.5 | 0.12 | 31 | 2.4 | 23.43 | 1.50 |
| May-80 | 0 | 0 | 273 | 31 | 0.08 | 3.2 | 0.10 | 30 | 2.2 | 23.51 | 1.53 |
| Jun-80 | 0 | 0 | 276 | 31 | 0.08 | 3.3 | 0.11 | 31 | 2.3 | 23.73 | 1.55 |
| ***Jul-80*** | 1844 | 1601 | 302 | 39 | 0.11 | 7.0 | 0.27 | 55 | 3.4 | 23.81 | 1.57 |
| Aug-80 | 0 | 0 | 337 | 48 | 0.15 | 3.4 | 0.11 | 36 | 3.4 | 24.04 | 1.65 |
| Sep-80 | 0 | 0 | 457 | 81 | 0.26 | 2.7 | 0.08 | 34 | 4.9 | 24.12 | 1.66 |
| ***Oct-80*** | 49 | 0 | 507 | 95 | 0.31 | 2.8 | 0.09 | 36 | 5.6 | 24.76 | 1.68 |
| Nov-80 | 0 | 0 | 474 | 86 | 0.28 | 2.7 | 0.08 | 29 | 5.2 | 25.21 | 1.70 |
| Dec-80 | 0 | 0 | 578 | 114 | 0.38 | 2.7 | 0.08 | 29 | 6.5 | 25.49 | 1.71 |
| Jan-81 | 0 | 0 | 615 | 124 | 0.42 | 3.1 | 0.10 | 32 | 7.2 | 25.11 | 1.71 |
| Feb-81 | 0 | 0 | 523 | 99 | 0.33 | 3.4 | 0.11 | 35 | 6.2 | 25.47 | 1.64 |
| Mar-81 | 0 | 0 | 472 | 85 | 0.28 | 3.8 | 0.13 | 39 | 5.7 | 26.04 | 1.55 |

Table 2B-11 Monthly Average Water Quality at
Banks Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 349 | 51 | 0.16 | 3.5 | 0.12 | 35 | 3.7 | 26.38 | 1.53 |
| ***May-81*** | 19 | 0 | 375 | 58 | 0.18 | 3.3 | 0.11 | 37 | 4.0 | 26.25 | 1.49 |
| ***Jun-81*** | 439 | 0 | 343 | 50 | 0.15 | 3.5 | 0.12 | 37 | 3.6 | 26.32 | 1.46 |
| ***Jul-81*** | 664 | 283 | 328 | 46 | 0.14 | 3.7 | 0.13 | 39 | 3.4 | 26.42 | 1.45 |
| Aug-81 | 0 | 0 | 455 | 80 | 0.26 | 2.6 | 0.08 | 34 | 4.8 | 26.56 | 1.41 |
| Sep-81 | 0 | 0 | 562 | 110 | 0.37 | 2.6 | 0.08 | 38 | 6.2 | 27.23 | 1.43 |
| Oct-81 | 0 | 0 | 715 | 152 | 0.52 | 2.7 | 0.08 | 46 | ***8.0*** | 26.50 | 1.41 |
| Nov-81 | 0 | 0 | 675 | 141 | 0.48 | 2.9 | 0.09 | 41 | 7.8 | 26.28 | 1.39 |
| Dec-81 | 0 | 0 | 396 | 64 | 0.20 | 4.5 | 0.16 | 30 | 4.6 | 27.55 | 1.41 |
| Jan-82 | 0 | 0 | 359 | 54 | 0.17 | 7.5 | 0.29 | 40 | 4.6 | 27.67 | 1.48 |
| Feb-82 | 0 | 0 | 262 | 28 | 0.07 | 5.6 | 0.21 | 30 | 2.3 | 26.85 | 1.55 |
| Mar-82 | 0 | 0 | 244 | 23 | 0.05 | 3.4 | 0.11 | 25 | 1.7 | 26.52 | 1.55 |
| Apr-82 | 0 | 0 | 154 | 10 | 0.01 | 4.1 | 0.14 | 26 | 0.5 | 26.35 | 1.53 |
| May-82 | 0 | 0 | 178 | 10 | 0.01 | 3.9 | 0.13 | 31 | 0.5 | 26.14 | 1.56 |
| Jun-82 | 0 | 0 | 242 | 22 | 0.05 | 3.3 | 0.11 | 30 | 1.6 | 26.01 | 1.59 |
| ***Jul-82*** | 1836 | 1613 | 296 | 37 | 0.10 | 7.6 | 0.29 | 58 | 3.3 | 26.06 | 1.61 |
| Aug-82 | 0 | 0 | 360 | 55 | 0.17 | 3.5 | 0.12 | 39 | 3.9 | 25.86 | 1.60 |
| Sep-82 | 0 | 0 | 468 | 84 | 0.27 | 2.5 | 0.08 | 33 | 5.0 | 26.09 | 1.62 |
| Oct-82 | 0 | 0 | 292 | 36 | 0.10 | 2.9 | 0.09 | 26 | 2.5 | 26.80 | 1.65 |
| Nov-82 | 0 | 0 | 252 | 25 | 0.06 | 3.3 | 0.11 | 24 | 1.8 | 26.38 | 1.68 |
| Dec-82 | 0 | 0 | 142 | 10 | 0.01 | 3.6 | 0.12 | 21 | 0.5 | 25.66 | 1.70 |
| Jan-83 | 0 | 0 | 149 | 10 | 0.01 | 3.9 | 0.13 | 20 | 0.5 | 24.26 | 1.71 |
| Feb-83 | 0 | 0 | 117 | 10 | 0.01 | 4.6 | 0.17 | 24 | 0.5 | 23.43 | 1.61 |
| Mar-83 | 0 | 0 | 157 | 10 | 0.01 | 5.4 | 0.20 | 29 | 0.5 | 23.40 | 1.61 |
| Apr-83 | 0 | 0 | 187 | 10 | 0.01 | 5.2 | 0.19 | 32 | 0.5 | 23.30 | 1.61 |
| May-83 | 0 | 0 | 160 | 10 | 0.01 | 4.8 | 0.18 | 32 | 0.5 | 23.05 | 1.63 |
| Jun-83 | 0 | 0 | 151 | 10 | 0.01 | 3.7 | 0.13 | 31 | 0.5 | 22.83 | 1.64 |
| Jul-83 | 0 | 0 | 187 | 10 | 0.01 | 3.4 | 0.11 | 28 | 0.5 | 22.73 | 1.66 |
| Aug-83 | 0 | 0 | 274 | 31 | 0.08 | 2.7 | 0.08 | 26 | 2.1 | 22.44 | 1.63 |
| Sep-83 | 0 | 0 | 352 | 52 | 0.16 | 2.7 | 0.08 | 29 | 3.4 | 22.73 | 1.66 |
| Oct-83 | 0 | 0 | 266 | 29 | 0.08 | 3.1 | 0.10 | 27 | 2.1 | 22.36 | 1.66 |
| Nov-83 | 0 | 0 | 200 | 11 | 0.01 | 3.3 | 0.11 | 22 | 0.5 | 21.72 | 1.67 |
| Dec-83 | 0 | 0 | 125 | 10 | 0.01 | 3.8 | 0.13 | 22 | 0.5 | 21.23 | 1.68 |
| Jan-84 | 0 | 0 | 174 | 10 | 0.01 | 4.4 | 0.15 | 19 | 0.5 | 20.46 | 1.70 |
| Feb-84 | 0 | 0 | 268 | 29 | 0.08 | 3.6 | 0.12 | 24 | 2.2 | 18.06 | 1.68 |
| Mar-84 | 0 | 0 | 331 | 47 | 0.14 | 3.1 | 0.10 | 26 | 3.2 | 17.29 | 1.69 |
| ***Apr-84*** | 188 | 0 | 341 | 49 | 0.15 | 3.2 | 0.10 | 32 | 3.4 | 17.03 | 1.69 |
| May-84 | 0 | 0 | 347 | 51 | 0.15 | 2.9 | 0.09 | 31 | 3.4 | 17.16 | 1.70 |
| ***Jun-84*** | 731 | 0 | 344 | 50 | 0.15 | 4.3 | 0.15 | 39 | 3.7 | 17.14 | 1.70 |
| ***Jul-84*** | 873 | 1535 | 287 | 35 | 0.10 | 5.5 | 0.20 | 44 | 2.8 | 17.19 | 1.71 |
| Aug-84 | 0 | 0 | 315 | 42 | 0.12 | 2.9 | 0.09 | 30 | 2.9 | 17.05 | 1.73 |
| Sep-84 | 0 | 0 | 463 | 83 | 0.27 | 2.6 | 0.08 | 34 | 5.0 | 16.70 | 1.74 |
| Oct-84 | 0 | 0 | 593 | 118 | 0.40 | 2.6 | 0.08 | 38 | 6.5 | 16.73 | 1.75 |
| Nov-84 | 0 | 0 | 581 | 115 | 0.38 | 2.8 | 0.09 | 36 | 6.6 | 16.94 | 1.76 |
| Dec-84 | 0 | 0 | 408 | 68 | 0.21 | 3.7 | 0.13 | 30 | 4.7 | 17.10 | 1.77 |
| ***Jan-85*** | 399 | 0 | 420 | 71 | 0.23 | 4.1 | 0.14 | 26 | 4.8 | 17.03 | 1.74 |
| ***Feb-85*** | 61 | 0 | 505 | 94 | 0.31 | 3.9 | 0.14 | 39 | 6.2 | 16.78 | 1.65 |
| Mar-85 | 0 | 0 | 496 | 92 | 0.30 | 3.7 | 0.13 | 41 | 6.0 | 16.98 | 1.60 |
| Apr-85 | 0 | 0 | 469 | 84 | 0.27 | 3.8 | 0.13 | 45 | 5.7 | 16.93 | 1.56 |
| May-85 | 0 | 0 | 402 | 66 | 0.21 | 3.3 | 0.11 | 39 | 4.4 | 17.03 | 1.51 |
| Jun-85 | 0 | 0 | 330 | 46 | 0.14 | 3.0 | 0.09 | 31 | 3.2 | 17.09 | 1.46 |
| ***Jul-85*** | 38 | 0 | 354 | 53 | 0.16 | 2.6 | 0.08 | 28 | 3.4 | 17.16 | 1.44 |
| Aug-85 | 0 | 0 | 501 | 93 | 0.31 | 2.4 | 0.07 | 34 | 5.3 | 17.70 | 1.41 |
| Sep-85 | 0 | 0 | 512 | 96 | 0.32 | 2.5 | 0.07 | 34 | 5.5 | 18.58 | 1.41 |
| Oct-85 | 0 | 0 | 658 | 136 | 0.46 | 2.7 | 0.08 | 43 | 7.4 | 17.58 | 1.38 |
| Nov-85 | 0 | 0 | 640 | 131 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 17.82 | 1.34 |
| Dec-85 | 0 | 0 | 603 | 121 | 0.41 | 3.8 | 0.13 | 42 | 7.5 | 18.32 | 1.31 |
| Jan-86 | 0 | 0 | 551 | 107 | 0.35 | 5.0 | 0.18 | 38 | 7.1 | 19.63 | 1.31 |
| Feb-86 | 0 | 0 | 343 | 50 | 0.15 | 9.5 | 0.38 | 54 | 4.6 | 21.47 | 1.37 |
| Mar-86 | 0 | 0 | 184 | 10 | 0.01 | 4.5 | 0.16 | 25 | 0.5 | 22.22 | 1.48 |
| Apr-86 | 0 | 0 | 231 | 19 | 0.04 | 4.1 | 0.14 | 28 | 1.4 | 22.24 | 1.48 |
| ***May-86*** | 290 | 0 | 260 | 27 | 0.07 | 4.0 | 0.14 | 36 | 2.1 | 22.35 | 1.48 |
| Jun-86 | 0 | 0 | 273 | 31 | 0.08 | 3.3 | 0.11 | 33 | 2.3 | 22.54 | 1.47 |
| ***Jul-86*** | 1837 | 1535 | 319 | 43 | 0.13 | 8.2 | 0.32 | **64** | 3.9 | 22.69 | 1.46 |
| Aug-86 | 0 | 0 | 382 | 60 | 0.19 | 3.9 | 0.14 | 44 | 4.3 | 22.98 | 1.49 |
| Sep-86 | 0 | 0 | 452 | 80 | 0.26 | 2.8 | 0.09 | 36 | 4.9 | 22.52 | 1.45 |

Table 2B-11 Monthly Average Water Quality at
Banks Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 481 | 88 | 0.29 | 2.6 | 0.08 | 32 | 5.2 | 22.91 | 1.45 |
| Nov-86 | 0 | 0 | 495 | 92 | 0.30 | 2.7 | 0.08 | 29 | 5.4 | 23.36 | 1.44 |
| Dec-86 | 0 | 0 | 616 | 124 | 0.42 | 3.0 | 0.09 | 33 | 7.1 | 23.58 | 1.42 |
| Jan-87 | 0 | 0 | 631 | 128 | 0.43 | 3.0 | 0.10 | 32 | 7.4 | 24.29 | 1.40 |
| Feb-87 | 0 | 0 | 693 | 146 | 0.49 | 3.5 | 0.12 | 45 | ***8.4*** | 26.21 | 1.40 |
| Mar-87 | 0 | 0 | 554 | 108 | 0.36 | 4.6 | 0.17 | 46 | 7.0 | 27.51 | 1.39 |
| Apr-87 | 0 | 0 | 406 | 67 | 0.21 | 5.0 | 0.18 | 45 | 4.9 | 27.92 | 1.40 |
| ***May-87*** | 414 | 0 | 409 | 68 | 0.21 | 4.2 | 0.15 | 42 | 4.7 | 27.74 | 1.39 |
| ***Jun-87*** | 517 | 0 | 356 | 53 | 0.16 | 3.9 | 0.13 | 42 | 3.9 | 27.65 | 1.38 |
| ***Jul-87*** | 54 | 5 | 324 | 45 | 0.13 | 2.8 | 0.09 | 30 | 3.0 | 27.57 | 1.37 |
| Aug-87 | 0 | 0 | 413 | 69 | 0.22 | 2.7 | 0.08 | 33 | 4.3 | 27.50 | 1.32 |
| Sep-87 | 0 | 0 | 484 | 88 | 0.29 | 2.8 | 0.09 | 37 | 5.3 | 27.41 | 1.30 |
| Oct-87 | 0 | 0 | 674 | 140 | 0.47 | 2.8 | 0.09 | 46 | 7.7 | 26.93 | 1.29 |
| Nov-87 | 0 | 0 | 636 | 130 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 26.46 | 1.27 |
| Dec-87 | 0 | 0 | 665 | 138 | 0.47 | 3.2 | 0.10 | 39 | 7.9 | 24.98 | 1.24 |
| Jan-88 | 0 | 0 | 624 | 127 | 0.43 | 4.9 | 0.18 | 42 | ***8.1*** | 25.60 | 1.21 |
| ***Feb-88*** | 139 | 0 | 503 | 94 | 0.31 | 5.7 | 0.21 | 46 | 6.7 | 27.28 | 1.26 |
| Mar-88 | 0 | 0 | 524 | 99 | 0.33 | 5.5 | 0.20 | 51 | 6.9 | 26.97 | 1.25 |
| Apr-88 | 0 | 0 | 506 | 94 | 0.31 | 4.7 | 0.17 | 50 | 6.3 | 26.79 | 1.25 |
| May-88 | 0 | 0 | 458 | 81 | 0.26 | 4.4 | 0.16 | 47 | 5.5 | 26.71 | 1.24 |
| Jun-88 | 0 | 0 | 469 | 84 | 0.27 | 4.1 | 0.15 | 46 | 5.6 | 26.63 | 1.24 |
| Jul-88 | 0 | 0 | 432 | 74 | 0.24 | 3.6 | 0.12 | 45 | 5.0 | 26.34 | 1.22 |
| Aug-88 | 0 | 0 | 494 | 91 | 0.30 | 3.6 | 0.12 | 49 | 5.9 | 25.48 | 1.18 |
| Sep-88 | 0 | 0 | 580 | 114 | 0.38 | 3.2 | 0.11 | 49 | 6.8 | 24.11 | 1.14 |
| Oct-88 | 0 | 0 | 732 | 156 | 0.53 | 3.0 | 0.09 | 52 | ***8.5*** | 23.62 | 1.13 |
| Nov-88 | 0 | 0 | 733 | 156 | 0.53 | 2.9 | 0.09 | 45 | ***8.5*** | 23.21 | 1.12 |
| Dec-88 | 0 | 0 | 691 | 145 | 0.49 | 3.0 | 0.10 | 38 | ***8.0*** | 22.86 | 1.11 |
| Jan-89 | 0 | 0 | 698 | 147 | 0.50 | 3.1 | 0.10 | 36 | ***8.2*** | 22.26 | 1.09 |
| Feb-89 | 0 | 0 | 694 | 146 | 0.49 | 3.6 | 0.12 | 47 | ***8.5*** | 21.09 | 1.01 |
| Mar-89 | 0 | 0 | 458 | 81 | 0.26 | 5.2 | 0.19 | 44 | 5.8 | 20.68 | 0.86 |
| Apr-89 | 0 | 0 | 294 | 36 | 0.10 | 5.5 | 0.20 | 40 | 3.0 | 21.90 | 0.89 |
| May-89 | 0 | 0 | 348 | 51 | 0.16 | 4.9 | 0.18 | 43 | 3.9 | 22.02 | 0.89 |
| ***Jun-89*** | 60 | 0 | 309 | 40 | 0.12 | 3.5 | 0.12 | 36 | 3.0 | 22.08 | 0.89 |
| ***Jul-89*** | 105 | 0 | 363 | 55 | 0.17 | 3.2 | 0.10 | 35 | 3.8 | 22.00 | 0.87 |
| Aug-89 | 0 | 0 | 388 | 62 | 0.20 | 2.7 | 0.08 | 32 | 4.0 | 21.92 | 0.81 |
| Sep-89 | 0 | 0 | 501 | 93 | 0.31 | 2.6 | 0.08 | 35 | 5.4 | 22.26 | 0.82 |
| Oct-89 | 0 | 0 | 645 | 132 | 0.45 | 2.6 | 0.08 | 41 | 7.2 | 21.78 | 0.80 |
| Nov-89 | 0 | 0 | 622 | 126 | 0.42 | 2.8 | 0.09 | 37 | 7.1 | 21.68 | 0.79 |
| Dec-89 | 0 | 0 | 621 | 128 | 0.42 | 3.2 | 0.11 | 37 | 7.4 | 21.97 | 0.80 |
| Jan-90 | 0 | 0 | 673 | 140 | 0.47 | 3.6 | 0.12 | 40 | ***8.3*** | 21.75 | 0.79 |
| Feb-90 | 0 | 0 | 662 | 137 | 0.46 | 5.0 | 0.18 | 51 | ***8.6*** | 21.54 | 0.79 |
| Mar-90 | 0 | 0 | 550 | 106 | 0.35 | 5.4 | 0.20 | 53 | 7.3 | 20.29 | 0.77 |
| Apr-90 | 0 | 0 | 594 | 118 | 0.40 | 5.0 | 0.18 | 60 | 7.7 | 19.72 | 0.75 |
| May-90 | 0 | 0 | 453 | 80 | 0.26 | 4.7 | 0.17 | 49 | 5.5 | 19.61 | 0.74 |
| Jun-90 | 0 | 0 | 439 | 76 | 0.24 | 3.8 | 0.13 | 48 | 5.2 | 19.68 | 0.74 |
| Jul-90 | 0 | 0 | 453 | 80 | 0.26 | 3.7 | 0.13 | 48 | 5.4 | 19.52 | 0.73 |
| Aug-90 | 0 | 0 | 521 | 99 | 0.33 | 3.8 | 0.13 | 54 | 6.4 | 19.10 | 0.70 |
| Sep-90 | 0 | 0 | 566 | 111 | 0.37 | 3.4 | 0.11 | 51 | 6.8 | 18.75 | 0.69 |
| Oct-90 | 0 | 0 | 760 | 164 | 0.56 | 3.0 | 0.10 | 55 | ***8.9*** | 18.78 | 0.69 |
| Nov-90 | 0 | 0 | 720 | 153 | 0.52 | 3.0 | 0.10 | 45 | ***8.4*** | 18.46 | 0.68 |
| Dec-90 | 0 | 0 | 613 | 124 | 0.42 | 2.9 | 0.09 | 33 | 7.0 | 18.15 | 0.67 |
| Jan-91 | 0 | 0 | 694 | 146 | 0.49 | 3.2 | 0.11 | 37 | ***8.3*** | 16.55 | 0.63 |
| Feb-91 | 0 | 0 | 783 | 170 | 0.58 | 3.6 | 0.12 | 53 | ***9.6*** | 14.49 | 0.55 |
| Mar-91 | 0 | 0 | 564 | 110 | 0.37 | 5.1 | 0.19 | 51 | 7.3 | 14.43 | 0.54 |
| Apr-91 | 0 | 0 | 396 | 64 | 0.20 | 5.9 | 0.22 | 51 | 5.0 | 15.75 | 0.60 |
| May-91 | 0 | 0 | 377 | 59 | 0.18 | 4.7 | 0.17 | 44 | 4.3 | 15.87 | 0.62 |
| Jun-91 | 0 | 0 | 418 | 70 | 0.22 | 3.8 | 0.13 | 46 | 4.9 | 15.95 | 0.62 |
| Jul-91 | 0 | 0 | 456 | 81 | 0.26 | 3.8 | 0.13 | 48 | 5.4 | 15.86 | 0.62 |
| Aug-91 | 0 | 0 | 520 | 98 | 0.32 | 3.9 | 0.13 | 55 | 6.4 | 15.82 | 0.62 |
| Sep-91 | 0 | 0 | 571 | 112 | 0.37 | 3.4 | 0.11 | 51 | 6.8 | 15.73 | 0.61 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-12 Monthly Average Water Quality at
Tracy Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 515 | 97 | 0.32 | 2.4 | 0.07 | 31 | 5.5 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | 393 | 84 | 0.20 | 2.6 | 0.08 | 25 | 4.0 | n/a | n/a |
| Dec-75 | 0 | 0 | 599 | 120 | 0.40 | 3.1 | 0.10 | 35 | 7.0 | n/a | n/a |
| Jan-76 | 0 | 0 | 616 | 125 | 0.42 | 3.3 | 0.11 | 34 | 7.4 | n/a | n/a |
| Feb-76 | 0 | 0 | 690 | 145 | 0.49 | 3.2 | 0.11 | 42 | ***8.2*** | n/a | n/a |
| Mar-76 | 0 | 0 | 613 | 124 | 0.42 | 3.1 | 0.10 | 40 | 7.2 | n/a | n/a |
| Apr-76 | 0 | 0 | 560 | 109 | 0.36 | 3.1 | 0.10 | 43 | 6.5 | n/a | n/a |
| May-76 | 0 | 0 | 448 | 78 | 0.25 | 3.2 | 0.10 | 40 | 5.0 | n/a | n/a |
| Jun-76 | 0 | 0 | 418 | 70 | 0.22 | 3.1 | 0.10 | 38 | 4.6 | n/a | n/a |
| Jul-76 | 0 | 0 | 410 | 68 | 0.22 | 3.0 | 0.10 | 36 | 4.4 | n/a | n/a |
| Aug-76 | 0 | 0 | 507 | 95 | 0.31 | 2.9 | 0.09 | 41 | 5.7 | n/a | n/a |
| Sep-76 | 0 | 0 | 516 | 97 | 0.32 | 2.7 | 0.08 | 38 | 5.7 | n/a | n/a |
| Oct-76 | 0 | 0 | 690 | 145 | 0.49 | 2.9 | 0.09 | 48 | 7.9 | n/a | n/a |
| Nov-76 | 0 | 0 | 660 | 136 | 0.46 | 3.1 | 0.10 | 44 | 7.8 | n/a | n/a |
| Dec-76 | 0 | 0 | 560 | 109 | 0.36 | 3.6 | 0.12 | 37 | 6.8 | n/a | n/a |
| Jan-77 | 0 | 0 | 691 | 145 | 0.49 | 3.6 | 0.12 | 40 | ***8.5*** | n/a | n/a |
| Feb-77 | 0 | 0 | 783 | 170 | 0.58 | 3.9 | 0.13 | 56 | ***9.9*** | n/a | n/a |
| Mar-77 | 0 | 0 | 1066 | ***247*** | 0.86 | 3.7 | 0.13 | ***82*** | ***12.9*** | n/a | n/a |
| Apr-77 | 0 | 0 | 657 | 136 | 0.46 | 3.5 | 0.12 | 58 | ***8.0*** | n/a | n/a |
| May-77 | 0 | 0 | 543 | 104 | 0.35 | 3.4 | 0.11 | 50 | 6.5 | n/a | n/a |
| Jun-77 | 0 | 0 | 568 | 111 | 0.37 | 3.4 | 0.11 | 52 | 6.8 | n/a | n/a |
| Jul-77 | 0 | 0 | 539 | 103 | 0.34 | 3.6 | 0.12 | 52 | 6.5 | n/a | n/a |
| Aug-77 | 0 | 0 | 465 | 83 | 0.27 | 3.5 | 0.12 | 45 | 5.4 | n/a | n/a |
| Sep-77 | 0 | 0 | 596 | 119 | 0.40 | 3.2 | 0.10 | 49 | 7.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 782 | 170 | 0.58 | 3.0 | 0.10 | 57 | ***9.1*** | n/a | n/a |
| Nov-77 | 0 | 0 | 750 | 161 | 0.55 | 3.0 | 0.10 | 48 | ***8.7*** | n/a | n/a |
| Dec-77 | 0 | 0 | 783 | 165 | 0.56 | 2.9 | 0.09 | 40 | ***8.8*** | n/a | n/a |
| Jan-78 | 0 | 0 | 530 | 101 | 0.33 | 6.8 | 0.26 | 48 | 7.5 | n/a | n/a |
| Feb-78 | 0 | 0 | 311 | 41 | 0.12 | 10.1 | 0.40 | 54 | 4.0 | n/a | n/a |
| Mar-78 | 0 | 0 | 340 | 49 | 0.15 | 4.6 | 0.16 | 33 | 3.6 | n/a | n/a |
| Apr-78 | 0 | 0 | 242 | 22 | 0.05 | 3.9 | 0.14 | 33 | 1.7 | n/a | n/a |
| May-78 | 0 | 0 | 230 | 19 | 0.04 | 3.8 | 0.13 | 32 | 1.4 | n/a | n/a |
| Jun-78 | 0 | 0 | 238 | 21 | 0.05 | 3.5 | 0.12 | 31 | 1.5 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 309 | 41 | 0.12 | 6.9 | 0.27 | 55 | 3.5 | n/a | n/a |
| Aug-78 | 0 | 0 | 349 | 52 | 0.16 | 3.3 | 0.11 | 36 | 3.6 | n/a | n/a |
| Sep-78 | 0 | 0 | 505 | 94 | 0.31 | 2.7 | 0.08 | 37 | 5.5 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 551 | 107 | 0.35 | 2.7 | 0.08 | 37 | 6.1 | 21.16 | 0.84 |
| Nov-78 | 0 | 0 | 508 | 95 | 0.31 | 2.8 | 0.09 | 31 | 5.6 | 21.24 | 0.84 |
| Dec-78 | 0 | 0 | 653 | 135 | 0.45 | 2.8 | 0.09 | 33 | 7.4 | 21.32 | 0.83 |
| Jan-79 | 0 | 0 | 480 | 87 | 0.28 | 3.9 | 0.13 | 32 | 5.8 | 21.03 | 0.82 |
| Feb-79 | 0 | 0 | 327 | 45 | 0.14 | 5.1 | 0.19 | 31 | 3.5 | 20.71 | 0.83 |
| Mar-79 | 0 | 0 | 310 | 41 | 0.12 | 5.7 | 0.21 | 37 | 3.2 | 19.85 | 0.84 |
| Apr-79 | 0 | 0 | 321 | 44 | 0.13 | 3.8 | 0.13 | 36 | 3.3 | 19.49 | 0.88 |
| May-79 | 0 | 0 | 291 | 36 | 0.10 | 3.3 | 0.11 | 32 | 2.6 | 19.51 | 0.90 |
| ***Jun-79*** | 350 | 0 | 301 | 38 | 0.11 | 3.8 | 0.13 | 38 | 2.9 | 19.47 | 0.91 |
| ***Jul-79*** | 1415 | 1558 | 302 | 39 | 0.11 | 5.7 | 0.21 | 46 | 3.2 | 19.33 | 0.92 |
| Aug-79 | 0 | 0 | 369 | 57 | 0.18 | 3.1 | 0.10 | 35 | 3.8 | 19.16 | 0.95 |
| Sep-79 | 0 | 0 | 532 | 102 | 0.34 | 2.7 | 0.08 | 38 | 5.9 | 19.06 | 0.96 |
| Oct-79 | 0 | 0 | 691 | 145 | 0.49 | 2.7 | 0.08 | 45 | 7.7 | 19.21 | 0.96 |
| Nov-79 | 0 | 0 | 565 | 111 | 0.37 | 2.5 | 0.07 | 31 | 6.2 | 19.25 | 0.96 |
| Dec-79 | 0 | 0 | 540 | 104 | 0.34 | 2.8 | 0.09 | 29 | 6.1 | 19.74 | 0.97 |
| Jan-80 | 0 | 0 | 292 | 36 | 0.10 | 6.7 | 0.26 | 33 | 3.1 | 20.18 | 0.98 |
| Feb-80 | 0 | 0 | 180 | 10 | 0.01 | 4.1 | 0.14 | 21 | 0.5 | 19.36 | 1.01 |
| Mar-80 | 0 | 0 | 233 | 20 | 0.04 | 4.3 | 0.15 | 26 | 1.5 | 18.09 | 1.02 |
| Apr-80 | 0 | 0 | 284 | 34 | 0.09 | 3.4 | 0.11 | 30 | 2.5 | 18.26 | 1.05 |
| May-80 | 0 | 0 | 277 | 32 | 0.09 | 3.2 | 0.10 | 30 | 2.3 | 18.06 | 1.06 |
| Jun-80 | 0 | 0 | 276 | 32 | 0.08 | 3.3 | 0.11 | 31 | 2.3 | 18.09 | 1.08 |
| ***Jul-80*** | 1844 | 1601 | 302 | 39 | 0.11 | 7.0 | 0.27 | 55 | 3.4 | 18.16 | 1.10 |
| Aug-80 | 0 | 0 | 337 | 48 | 0.14 | 3.4 | 0.11 | 36 | 3.4 | 18.31 | 1.15 |
| Sep-80 | 0 | 0 | 455 | 81 | 0.26 | 2.7 | 0.08 | 34 | 4.9 | 18.60 | 1.17 |
| ***Oct-80*** | 49 | 0 | 515 | 97 | 0.32 | 2.8 | 0.09 | 36 | 5.7 | 18.80 | 1.18 |
| Nov-80 | 0 | 0 | 473 | 85 | 0.28 | 2.7 | 0.08 | 29 | 5.2 | 19.05 | 1.20 |
| Dec-80 | 0 | 0 | 583 | 115 | 0.39 | 2.8 | 0.09 | 30 | 6.6 | 18.85 | 1.20 |
| Jan-81 | 0 | 0 | 601 | 120 | 0.40 | 3.2 | 0.10 | 32 | 7.1 | 18.43 | 1.20 |
| Feb-81 | 0 | 0 | 526 | 100 | 0.33 | 3.4 | 0.11 | 35 | 6.3 | 18.44 | 1.17 |
| Mar-81 | 0 | 0 | 509 | 95 | 0.31 | 3.7 | 0.13 | 41 | 6.2 | 18.61 | 1.10 |

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Table 2B-12 Monthly Average Water Quality at
Tracy Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-81 | 0 | 0 | 403 | 66 | 0.21 | 3.4 | 0.11 | 37 | 4.5 | 18.82 | 1.08 |
| ***May-81*** | 19 | 0 | 380 | 60 | 0.19 | 3.3 | 0.11 | 37 | 4.1 | 19.19 | 1.09 |
| ***Jun-81*** | 439 | 0 | 343 | 50 | 0.15 | 3.5 | 0.12 | 37 | 3.5 | 19.31 | 1.07 |
| ***Jul-81*** | 664 | 283 | 328 | 46 | 0.14 | 3.7 | 0.13 | 39 | 3.4 | 19.58 | 1.07 |
| Aug-81 | 0 | 0 | 456 | 81 | 0.26 | 2.6 | 0.08 | 34 | 4.8 | 19.67 | 1.05 |
| Sep-81 | 0 | 0 | 562 | 110 | 0.37 | 2.6 | 0.08 | 38 | 6.2 | 19.94 | 1.04 |
| Oct-81 | 0 | 0 | 718 | 152 | 0.52 | 2.7 | 0.08 | 46 | ***8.1*** | 20.08 | 1.04 |
| Nov-81 | 0 | 0 | 679 | 142 | 0.48 | 2.9 | 0.09 | 41 | 7.8 | 20.14 | 1.04 |
| Dec-81 | 0 | 0 | 480 | 87 | 0.28 | 4.1 | 0.14 | 32 | 5.7 | 20.75 | 1.04 |
| Jan-82 | 0 | 0 | 381 | 60 | 0.19 | 8.1 | 0.32 | 44 | 5.2 | 20.75 | 1.06 |
| Feb-82 | 0 | 0 | 247 | 24 | 0.06 | 5.4 | 0.20 | 29 | 1.9 | 20.52 | 1.10 |
| Mar-82 | 0 | 0 | 251 | 25 | 0.06 | 3.3 | 0.11 | 24 | 1.8 | 20.33 | 1.10 |
| Apr-82 | 0 | 0 | 155 | 10 | 0.01 | 4.1 | 0.14 | 26 | 0.5 | 20.19 | 1.08 |
| May-82 | 0 | 0 | 172 | 10 | 0.01 | 3.8 | 0.13 | 31 | 0.5 | 19.92 | 1.09 |
| Jun-82 | 0 | 0 | 242 | 22 | 0.05 | 3.4 | 0.11 | 30 | 1.6 | 19.72 | 1.09 |
| ***Jul-82*** | 1836 | 1613 | 296 | 37 | 0.10 | 7.5 | 0.29 | 58 | 3.3 | 19.57 | 1.09 |
| Aug-82 | 0 | 0 | 359 | 54 | 0.17 | 3.6 | 0.12 | 39 | 3.9 | 19.54 | 1.10 |
| Sep-82 | 0 | 0 | 468 | 84 | 0.27 | 2.5 | 0.08 | 33 | 5.0 | 19.52 | 1.11 |
| Oct-82 | 0 | 0 | 300 | 38 | 0.11 | 3.0 | 0.09 | 27 | 2.7 | 19.36 | 1.11 |
| Nov-82 | 0 | 0 | 258 | 26 | 0.07 | 3.3 | 0.11 | 24 | 1.9 | 18.61 | 1.11 |
| Dec-82 | 0 | 0 | 151 | 10 | 0.01 | 3.6 | 0.12 | 20 | 0.5 | 17.88 | 1.12 |
| Jan-83 | 0 | 0 | 221 | 16 | 0.03 | 4.0 | 0.14 | 21 | 1.2 | 17.07 | 1.13 |
| Feb-83 | 0 | 0 | 154 | 10 | 0.01 | 4.8 | 0.17 | 24 | 0.5 | 16.91 | 1.10 |
| Mar-83 | 0 | 0 | 200 | 11 | 0.01 | 5.4 | 0.20 | 29 | 0.6 | 16.88 | 1.09 |
| Apr-83 | 0 | 0 | 186 | 10 | 0.01 | 5.2 | 0.19 | 32 | 0.5 | 16.76 | 1.08 |
| May-83 | 0 | 0 | 157 | 10 | 0.01 | 4.8 | 0.17 | 32 | 0.5 | 16.65 | 1.09 |
| Jun-83 | 0 | 0 | 152 | 10 | 0.01 | 3.7 | 0.13 | 31 | 0.5 | 16.51 | 1.11 |
| Jul-83 | 0 | 0 | 187 | 10 | 0.01 | 3.4 | 0.11 | 28 | 0.5 | 16.31 | 1.11 |
| Aug-83 | 0 | 0 | 274 | 31 | 0.08 | 2.8 | 0.08 | 26 | 2.1 | 16.10 | 1.09 |
| Sep-83 | 0 | 0 | 351 | 52 | 0.16 | 2.7 | 0.08 | 29 | 3.4 | 15.94 | 1.08 |
| Oct-83 | 0 | 0 | 272 | 30 | 0.08 | 3.1 | 0.10 | 27 | 2.2 | 15.69 | 1.08 |
| Nov-83 | 0 | 0 | 202 | 11 | 0.01 | 3.3 | 0.11 | 22 | 0.6 | 15.10 | 1.09 |
| Dec-83 | 0 | 0 | 156 | 10 | 0.01 | 3.8 | 0.13 | 21 | 0.5 | 14.66 | 1.10 |
| Jan-84 | 0 | 0 | 176 | 10 | 0.01 | 4.4 | 0.15 | 19 | 0.5 | 13.70 | 1.08 |
| Feb-84 | 0 | 0 | 268 | 29 | 0.08 | 3.4 | 0.11 | 23 | 2.2 | 12.87 | 1.08 |
| Mar-84 | 0 | 0 | 347 | 51 | 0.15 | 3.1 | 0.10 | 27 | 3.5 | 12.51 | 1.08 |
| ***Apr-84*** | 188 | 0 | 370 | 57 | 0.18 | 3.2 | 0.10 | 33 | 3.9 | 12.25 | 1.08 |
| May-84 | 0 | 0 | 351 | 52 | 0.16 | 2.9 | 0.09 | 31 | 3.5 | 12.16 | 1.07 |
| ***Jun-84*** | 731 | 0 | 344 | 50 | 0.15 | 4.3 | 0.15 | 39 | 3.6 | 12.19 | 1.07 |
| ***Jul-84*** | 873 | 1535 | 288 | 35 | 0.10 | 5.5 | 0.20 | 44 | 2.8 | 12.19 | 1.08 |
| Aug-84 | 0 | 0 | 315 | 42 | 0.12 | 2.9 | 0.09 | 30 | 2.9 | 12.09 | 1.10 |
| Sep-84 | 0 | 0 | 462 | 82 | 0.27 | 2.6 | 0.08 | 34 | 4.9 | 11.73 | 1.10 |
| Oct-84 | 0 | 0 | 601 | 120 | 0.40 | 2.6 | 0.08 | 38 | 6.7 | 11.48 | 1.10 |
| Nov-84 | 0 | 0 | 585 | 116 | 0.39 | 2.8 | 0.09 | 36 | 6.6 | 11.52 | 1.11 |
| Dec-84 | 0 | 0 | 454 | 80 | 0.26 | 3.7 | 0.13 | 33 | 5.4 | 11.29 | 1.11 |
| ***Jan-85*** | 399 | 0 | 454 | 80 | 0.26 | 4.1 | 0.14 | 28 | 5.3 | 11.23 | 1.10 |
| ***Feb-85*** | 61 | 0 | 533 | 102 | 0.34 | 3.8 | 0.13 | 40 | 6.6 | 11.40 | 1.07 |
| Mar-85 | 0 | 0 | 523 | 99 | 0.33 | 3.7 | 0.13 | 42 | 6.4 | 12.08 | 1.05 |
| Apr-85 | 0 | 0 | 496 | 92 | 0.30 | 3.7 | 0.13 | 47 | 6.0 | 12.73 | 1.06 |
| May-85 | 0 | 0 | 408 | 67 | 0.21 | 3.3 | 0.11 | 39 | 4.5 | 13.11 | 1.04 |
| Jun-85 | 0 | 0 | 330 | 46 | 0.14 | 3.0 | 0.09 | 31 | 3.2 | 13.35 | 1.02 |
| ***Jul-85*** | 38 | 0 | 354 | 53 | 0.16 | 2.6 | 0.08 | 28 | 3.4 | 13.54 | 1.02 |
| Aug-85 | 0 | 0 | 502 | 93 | 0.31 | 2.4 | 0.07 | 34 | 5.3 | 13.71 | 0.98 |
| Sep-85 | 0 | 0 | 512 | 96 | 0.32 | 2.5 | 0.07 | 34 | 5.5 | 14.07 | 0.97 |
| Oct-85 | 0 | 0 | 662 | 137 | 0.46 | 2.7 | 0.08 | 43 | 7.4 | 14.05 | 0.96 |
| Nov-85 | 0 | 0 | 640 | 131 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 14.61 | 0.95 |
| Dec-85 | 0 | 0 | 616 | 125 | 0.42 | 4.1 | 0.14 | 39 | 7.5 | 15.08 | 0.94 |
| Jan-86 | 0 | 0 | 577 | 114 | 0.38 | 5.0 | 0.18 | 40 | 7.5 | 16.07 | 0.94 |
| Feb-86 | 0 | 0 | 363 | 55 | 0.17 | 9.9 | 0.40 | 58 | 5.1 | 16.91 | 0.95 |
| Mar-86 | 0 | 0 | 205 | 12 | 0.02 | 4.5 | 0.16 | 25 | 0.7 | 17.33 | 1.01 |
| Apr-86 | 0 | 0 | 229 | 19 | 0.04 | 4.0 | 0.14 | 31 | 1.4 | 17.39 | 1.03 |
| ***May-86*** | 290 | 0 | 263 | 28 | 0.07 | 4.0 | 0.14 | 36 | 2.2 | 17.48 | 1.03 |
| Jun-86 | 0 | 0 | 273 | 31 | 0.08 | 3.3 | 0.11 | 32 | 2.3 | 17.53 | 1.01 |
| ***Jul-86*** | 1837 | 1535 | 319 | 43 | 0.13 | 8.1 | 0.32 | 64 | 3.9 | 17.64 | 1.00 |
| Aug-86 | 0 | 0 | 378 | 59 | 0.19 | 3.9 | 0.14 | 44 | 4.3 | 17.59 | 0.97 |
| Sep-86 | 0 | 0 | 451 | 79 | 0.26 | 2.8 | 0.09 | 36 | 4.9 | 17.84 | 0.98 |

Table 2B-12 Monthly Average Water Quality at
Tracy Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | EC [umhos/cm] | Chloride [mg/l] | Bromide [mg/l] | DOC [mg/l] | UVA [1/cm] | TTHM [ug/l] | Bromate [ug/l] | 3-Year Chloride [1000 metric tons/month] | 3-Year DOC [1000 metric tons/month] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-86 | 0 | 0 | 489 | 90 | 0.29 | 2.6 | 0.08 | 32 | 5.3 | 18.08 | 0.98 |
| Nov-86 | 0 | 0 | 495 | 92 | 0.30 | 2.7 | 0.08 | 29 | 5.4 | 18.59 | 0.98 |
| Dec-86 | 0 | 0 | 616 | 124 | 0.42 | 3.0 | 0.10 | 34 | 7.1 | 19.29 | 0.98 |
| Jan-87 | 0 | 0 | 637 | 130 | 0.44 | 3.1 | 0.10 | 32 | 7.4 | 19.92 | 0.98 |
| Feb-87 | 0 | 0 | 706 | 149 | 0.51 | 3.4 | 0.11 | 45 | ***8.5*** | 20.20 | 0.97 |
| Mar-87 | 0 | 0 | 580 | 115 | 0.38 | 4.5 | 0.16 | 47 | 7.3 | 20.55 | 0.96 |
| Apr-87 | 0 | 0 | 438 | 76 | 0.24 | 4.8 | 0.18 | 46 | 5.3 | 20.81 | 0.97 |
| ***May-87*** | 414 | 0 | 413 | 69 | 0.22 | 4.2 | 0.15 | 42 | 4.8 | 20.81 | 0.97 |
| ***Jun-87*** | 517 | 0 | 356 | 53 | 0.16 | 3.9 | 0.13 | 42 | 3.9 | 20.88 | 0.98 |
| ***Jul-87*** | 54 | 5 | 324 | 45 | 0.13 | 2.8 | 0.09 | 30 | 3.0 | 20.91 | 0.97 |
| Aug-87 | 0 | 0 | 414 | 69 | 0.22 | 2.7 | 0.08 | 33 | 4.3 | 21.00 | 0.95 |
| Sep-87 | 0 | 0 | 484 | 88 | 0.29 | 2.7 | 0.08 | 36 | 5.3 | 21.25 | 0.95 |
| Oct-87 | 0 | 0 | 672 | 140 | 0.47 | 2.8 | 0.09 | 46 | 7.6 | 21.02 | 0.94 |
| Nov-87 | 0 | 0 | 637 | 130 | 0.44 | 2.9 | 0.09 | 39 | 7.3 | 20.88 | 0.93 |
| Dec-87 | 0 | 0 | 673 | 140 | 0.47 | 3.2 | 0.11 | 40 | ***8.0*** | 20.40 | 0.92 |
| Jan-88 | 0 | 0 | 653 | 134 | 0.45 | 4.7 | 0.17 | 42 | ***8.4*** | 20.92 | 0.92 |
| ***Feb-88*** | 139 | 0 | 537 | 103 | 0.34 | 5.5 | 0.21 | 47 | 7.1 | 21.38 | 0.92 |
| Mar-88 | 0 | 0 | 558 | 109 | 0.36 | 5.6 | 0.21 | 55 | 7.5 | 21.33 | 0.93 |
| Apr-88 | 0 | 0 | 524 | 99 | 0.33 | 4.8 | 0.17 | 52 | 6.6 | 21.09 | 0.93 |
| May-88 | 0 | 0 | 460 | 82 | 0.27 | 4.4 | 0.16 | 47 | 5.5 | 20.94 | 0.93 |
| Jun-88 | 0 | 0 | 470 | 85 | 0.28 | 4.1 | 0.15 | 46 | 5.6 | 20.81 | 0.92 |
| Jul-88 | 0 | 0 | 433 | 74 | 0.24 | 3.6 | 0.12 | 45 | 5.0 | 20.64 | 0.91 |
| Aug-88 | 0 | 0 | 494 | 91 | 0.30 | 3.6 | 0.12 | 49 | 5.9 | 20.30 | 0.89 |
| Sep-88 | 0 | 0 | 581 | 115 | 0.38 | 3.2 | 0.10 | 49 | 6.8 | 19.69 | 0.88 |
| Oct-88 | 0 | 0 | 730 | 156 | 0.53 | 3.0 | 0.09 | 52 | ***8.5*** | 19.72 | 0.88 |
| Nov-88 | 0 | 0 | 732 | 156 | 0.53 | 2.9 | 0.09 | 45 | ***8.5*** | 19.57 | 0.88 |
| Dec-88 | 0 | 0 | 688 | 144 | 0.49 | 3.1 | 0.10 | 38 | ***8.1*** | 19.66 | 0.88 |
| Jan-89 | 0 | 0 | 698 | 147 | 0.50 | 3.2 | 0.10 | 36 | ***8.2*** | 19.67 | 0.87 |
| Feb-89 | 0 | 0 | 729 | 155 | 0.53 | 3.6 | 0.12 | 49 | ***9.0*** | 19.95 | 0.85 |
| Mar-89 | 0 | 0 | 544 | 105 | 0.35 | 5.6 | 0.21 | 54 | 7.3 | 19.84 | 0.77 |
| Apr-89 | 0 | 0 | 355 | 53 | 0.16 | 5.5 | 0.20 | 45 | 4.1 | 20.63 | 0.78 |
| May-89 | 0 | 0 | 352 | 52 | 0.16 | 4.9 | 0.18 | 44 | 4.0 | 20.78 | 0.78 |
| ***Jun-89*** | 60 | 0 | 307 | 40 | 0.12 | 3.5 | 0.12 | 35 | 2.9 | 20.88 | 0.79 |
| ***Jul-89*** | 105 | 0 | 364 | 56 | 0.17 | 3.1 | 0.10 | 35 | 3.8 | 20.88 | 0.78 |
| Aug-89 | 0 | 0 | 391 | 63 | 0.20 | 2.7 | 0.08 | 32 | 4.0 | 21.23 | 0.80 |
| Sep-89 | 0 | 0 | 500 | 93 | 0.30 | 2.6 | 0.08 | 35 | 5.4 | 21.10 | 0.78 |
| Oct-89 | 0 | 0 | 645 | 132 | 0.45 | 2.6 | 0.08 | 41 | 7.2 | 21.22 | 0.78 |
| Nov-89 | 0 | 0 | 624 | 127 | 0.43 | 2.8 | 0.09 | 37 | 7.1 | 21.20 | 0.77 |
| Dec-89 | 0 | 0 | 628 | 127 | 0.43 | 3.3 | 0.11 | 37 | 7.5 | 20.83 | 0.75 |
| Jan-90 | 0 | 0 | 682 | 143 | 0.48 | 3.6 | 0.12 | 40 | ***8.4*** | 20.88 | 0.76 |
| Feb-90 | 0 | 0 | 680 | 142 | 0.48 | 5.0 | 0.18 | 53 | ***8.9*** | 21.78 | 0.78 |
| Mar-90 | 0 | 0 | 573 | 113 | 0.38 | 5.5 | 0.20 | 55 | 7.6 | 22.48 | 0.81 |
| Apr-90 | 0 | 0 | 600 | 120 | 0.40 | 5.1 | 0.19 | 61 | 7.8 | 22.51 | 0.82 |
| May-90 | 0 | 0 | 456 | 81 | 0.26 | 4.7 | 0.17 | 49 | 5.6 | 22.26 | 0.80 |
| Jun-90 | 0 | 0 | 441 | 77 | 0.25 | 3.8 | 0.13 | 48 | 5.2 | 22.13 | 0.79 |
| Jul-90 | 0 | 0 | 453 | 80 | 0.26 | 3.7 | 0.13 | 48 | 5.4 | 21.76 | 0.76 |
| Aug-90 | 0 | 0 | 521 | 99 | 0.33 | 3.8 | 0.13 | 54 | 6.4 | 21.45 | 0.74 |
| Sep-90 | 0 | 0 | 569 | 112 | 0.37 | 3.4 | 0.11 | 50 | 6.8 | 21.04 | 0.72 |
| Oct-90 | 0 | 0 | 755 | 162 | 0.55 | 3.0 | 0.10 | 55 | ***8.8*** | 21.11 | 0.72 |
| Nov-90 | 0 | 0 | 725 | 154 | 0.53 | 3.0 | 0.10 | 45 | ***8.4*** | 21.04 | 0.72 |
| Dec-90 | 0 | 0 | 620 | 125 | 0.42 | 2.9 | 0.09 | 33 | 7.1 | 20.91 | 0.72 |
| Jan-91 | 0 | 0 | 693 | 146 | 0.49 | 3.1 | 0.10 | 36 | ***8.2*** | 20.28 | 0.70 |
| Feb-91 | 0 | 0 | 790 | 172 | 0.59 | 3.5 | 0.12 | 51 | ***9.6*** | 19.60 | 0.67 |
| Mar-91 | 0 | 0 | 594 | 119 | 0.40 | 5.3 | 0.20 | 55 | 7.9 | 19.43 | 0.64 |
| Apr-91 | 0 | 0 | 411 | 68 | 0.22 | 5.8 | 0.22 | 52 | 5.2 | 19.82 | 0.66 |
| May-91 | 0 | 0 | 382 | 60 | 0.19 | 4.7 | 0.17 | 44 | 4.4 | 19.76 | 0.66 |
| Jun-91 | 0 | 0 | 441 | 77 | 0.25 | 4.0 | 0.14 | 50 | 5.3 | 19.75 | 0.67 |
| Jul-91 | 0 | 0 | 457 | 81 | 0.26 | 3.8 | 0.13 | 49 | 5.5 | 19.52 | 0.65 |
| Aug-91 | 0 | 0 | 519 | 98 | 0.32 | 3.9 | 0.13 | 55 | 6.4 | 19.44 | 0.65 |
| Sep-91 | 0 | 0 | 573 | 113 | 0.38 | 3.4 | 0.11 | 51 | 6.9 | 19.31 | 0.65 |

1. Project Release Months are shown in ***Bold***.
2. WQMP Chloride Violations (> 225 mg/l) are shown in ***Bold***.
3. WQMP TTHM Violations (> 64 ug/l) are shown in ***Bold***.
4. WQMP Bromate Violations (> 8 ug/l) are shown in ***Bold***.

Table 2B-13 Monthly Average Water Quality Change at
Rock Slough: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Oct-75 | 0 | 0 | **13** | -0.1 | 0.5 | 0.4 | n/a | n/a |
| **Nov-75** | 49 | 0 | -9 | -0.1 | -2.4 | -0.5 | n/a | n/a |
| Dec-75 | 0 | 0 | -12 | -0.1 | -3.7 | -0.6 | n/a | n/a |
| Jan-76 | 0 | 0 | -26 | -0.2 | -7.9 | -1.3 | n/a | n/a |
| Feb-76 | 0 | 0 | -23 | -0.4 | -9.9 | -1.3 | n/a | n/a |
| Mar-76 | 0 | 0 | -5 | -0.5 | -5.9 | -0.5 | n/a | n/a |
| Apr-76 | 0 | 0 | 2 | -0.4 | -4.2 | -0.1 | n/a | n/a |
| May-76 | 0 | 0 | -1 | -0.3 | -4.1 | -0.2 | n/a | n/a |
| Jun-76 | 0 | 0 | 0 | -0.3 | -3.9 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 4 | -0.3 | -3.1 | 0.0 | n/a | n/a |
| Aug-76 | 0 | 0 | 9 | -0.2 | -1.5 | 0.2 | n/a | n/a |
| Sep-76 | 0 | 0 | -2 | -0.1 | -2.6 | -0.2 | n/a | n/a |
| Oct-76 | 0 | 0 | 2 | -0.2 | -3.1 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 4 | -0.2 | -2.1 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 3 | -0.3 | -2.9 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 3 | -0.5 | -6.1 | -0.4 | n/a | n/a |
| Feb-77 | 0 | 0 | -1 | -0.6 | -9.0 | -0.6 | n/a | n/a |
| Mar-77 | 0 | 0 | 4 | -0.9 | -2.9 | -0.1 | n/a | n/a |
| Apr-77 | 0 | 0 | 2 | -0.5 | -5.6 | -0.2 | n/a | n/a |
| May-77 | 0 | 0 | -1 | -0.4 | -5.4 | -0.3 | n/a | n/a |
| Jun-77 | 0 | 0 | 1 | -0.4 | -6.7 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 3 | -0.4 | -5.1 | -0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 3 | -0.3 | -3.9 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 4 | -0.2 | -3.3 | -0.1 | n/a | n/a |
| Oct-77 | 0 | 0 | -1 | -0.2 | -6.1 | -0.4 | n/a | n/a |
| Nov-77 | 0 | 0 | 4 | -0.2 | -2.6 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 9 | -0.3 | -3.2 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | -3 | -0.8 | -5.8 | -0.5 | n/a | n/a |
| Feb-78 | 0 | 0 | -6 | -1.2 | -8.1 | -0.7 | n/a | n/a |
| Mar-78 | 0 | 0 | -3 | -0.8 | -5.5 | -0.4 | n/a | n/a |
| Apr-78 | 0 | 0 | -1 | -0.2 | -2.1 | -0.1 | n/a | n/a |
| May-78 | 0 | 0 | -1 | -0.1 | -1.3 | -0.1 | n/a | n/a |
| Jun-78 | 0 | 0 | -2 | -0.1 | -1.7 | -0.1 | n/a | n/a |
| **Jul-78** | 1844 | 1617 | 0 | 0.6 | 5.5 | 0.1 | n/a | n/a |
| Aug-78 | 0 | 0 | 6 | 0.0 | 0.7 | 0.3 | n/a | n/a |
| Sep-78 | 0 | 0 | **26** | -0.1 | 3.5 | 1.0 | n/a | n/a |
| **Oct-78** | 28 | 0 | 6 | -0.1 | -0.7 | 0.1 | 1.6 | -7.8 |
| Nov-78 | 0 | 0 | 1 | -0.1 | -1.3 | -0.1 | 1.5 | -7.8 |
| Dec-78 | 0 | 0 | 8 | -0.1 | -1.0 | 0.1 | 1.8 | -7.8 |
| Jan-79 | 0 | 0 | 5 | -0.5 | -4.2 | -0.1 | 2.1 | -7.8 |
| Feb-79 | 0 | 0 | -6 | -1.1 | -8.1 | -0.7 | 2.5 | -7.9 |
| Mar-79 | 0 | 0 | -3 | -0.7 | -4.8 | -0.3 | 2.8 | -8.2 |
| Apr-79 | 0 | 0 | -1 | -0.2 | -2.4 | -0.1 | 2.8 | -8.2 |
| May-79 | 0 | 0 | -1 | -0.2 | -1.8 | -0.1 | 2.8 | -8.2 |
| **Jun-79** | 350 | 0 | -2 | -0.2 | -2.2 | -0.2 | 2.9 | -8.1 |
| **Jul-79** | 1415 | 1558 | 0 | 0.5 | 5.6 | 0.2 | 2.7 | -7.9 |
| Aug-79 | 0 | 0 | 9 | 0.0 | 1.0 | 0.4 | 2.7 | -6.9 |
| Sep-79 | 0 | 0 | **29** | -0.1 | 3.3 | 1.0 | 2.8 | -6.7 |
| Oct-79 | 0 | 0 | **22** | -0.1 | 1.5 | **0.6** | 3.8 | -6.7 |
| Nov-79 | 0 | 0 | 5 | -0.1 | -0.7 | 0.1 | 4.3 | -6.7 |
| Dec-79 | 0 | 0 | **14** | -0.2 | 0.1 | 0.4 | 4.3 | -6.6 |
| Jan-80 | 0 | 0 | -1 | -0.7 | -4.5 | -0.3 | 4.5 | -6.6 |
| Feb-80 | 0 | 0 | -13 | -1.1 | -8.8 | -1.1 | 4.5 | -6.7 |
| Mar-80 | 0 | 0 | 2 | -0.4 | 2.1 | 0.2 | 4.6 | -6.6 |
| Apr-80 | 0 | 0 | -1 | -0.3 | -2.9 | -0.2 | 4.7 | -6.2 |
| May-80 | 0 | 0 | -1 | -0.1 | -1.6 | -0.1 | 4.7 | -5.9 |
| Jun-80 | 0 | 0 | -2 | -0.2 | -1.9 | -0.2 | 4.8 | -5.7 |
| **Jul-80** | 1844 | 1601 | -1 | 0.6 | 5.6 | 0.1 | 4.7 | -5.5 |
| Aug-80 | 0 | 0 | 5 | 0.0 | 0.4 | 0.3 | 4.7 | -4.2 |
| Sep-80 | 0 | 0 | **21** | -0.1 | 3.8 | 1.2 | 4.9 | -3.9 |
| **Oct-80** | 49 | 0 | 8 | -0.1 | -0.3 | 0.2 | **6.0** | -3.8 |
| Nov-80 | 0 | 0 | -2 | -0.1 | -1.8 | -0.2 | **6.6** | -3.7 |
| Dec-80 | 0 | 0 | -9 | -0.1 | -3.0 | -0.5 | **6.5** | -3.6 |
| Jan-81 | 0 | 0 | -8 | -0.2 | -4.4 | -0.5 | **6.3** | -3.6 |
| Feb-81 | 0 | 0 | -6 | -0.4 | -4.5 | -0.5 | **6.1** | -3.3 |
| Mar-81 | 0 | 0 | -1 | -0.4 | -3.2 | -0.2 | **6.2** | -2.7 |
| Apr-81 | 0 | 0 | -2 | -0.3 | -2.9 | -0.2 | **6.2** | -2.6 |

Table 2B-13 Monthly Average Water Quality Change at
Rock Slough: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| ***May-81*** | 19 | 0 | -1 | -0.2 | -2.8 | -0.2 | ***6.3*** | -2.5 |
| ***Jun-81*** | 439 | 0 | -1 | -0.2 | -2.7 | -0.2 | ***6.3*** | -2.6 |
| ***Jul-81*** | 664 | 263 | -2 | 0.0 | -0.6 | -0.1 | ***6.1*** | -2.9 |
| Aug-81 | 0 | 0 | 9 | -0.1 | -0.5 | 0.3 | ***6.0*** | -4.3 |
| Sep-81 | 0 | 0 | **19** | -0.1 | 1.5 | 0.6 | ***6.0*** | -4.5 |
| Oct-81 | 0 | 0 | 5 | -0.1 | -1.6 | 0.0 | ***5.1*** | -4.6 |
| Nov-81 | 0 | 0 | -9 | -0.1 | -3.4 | -0.4 | ***5.0*** | -4.6 |
| Dec-81 | 0 | 0 | -4 | -0.2 | -1.8 | -0.3 | 4.7 | -4.6 |
| Jan-82 | 0 | 0 | -7 | -0.9 | -5.7 | -0.7 | 4.5 | -4.6 |
| Feb-82 | 0 | 0 | 0 | -0.6 | -3.2 | -0.1 | 4.4 | -4.6 |
| Mar-82 | 0 | 0 | -1 | -1.4 | -8.6 | -0.4 | 4.5 | -4.5 |
| Apr-82 | 0 | 0 | -1 | -0.5 | -3.6 | -0.1 | 4.6 | -4.2 |
| May-82 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | 4.6 | -4.2 |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.5 | -0.1 | 4.7 | -4.2 |
| ***Jul-82*** | 1636 | 1613 | -1 | 0.6 | 5.5 | 0.1 | 4.7 | -4.1 |
| Aug-82 | 0 | 0 | 9 | 0.0 | 1.1 | 0.5 | 4.6 | -4.0 |
| Sep-82 | 0 | 0 | **22** | -0.1 | 4.1 | 1.3 | 4.7 | -3.9 |
| Oct-82 | 0 | 0 | 5 | 0.0 | 0.3 | 0.3 | 4.9 | -3.9 |
| Nov-82 | 0 | 0 | -3 | -0.1 | -1.2 | -0.2 | 4.5 | -3.8 |
| Dec-82 | 0 | 0 | 0 | -0.9 | -1.1 | -0.1 | 4.4 | -3.8 |
| Jan-83 | 0 | 0 | -1 | -0.6 | -3.5 | -0.3 | 4.1 | -4.2 |
| Feb-83 | 0 | 0 | 0 | -0.1 | -0.3 | 0.0 | 4.1 | -4.2 |
| Mar-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 4.3 | -3.9 |
| Apr-83 | 0 | 0 | -1 | -0.4 | -2.4 | -0.2 | 4.3 | -3.7 |
| May-83 | 0 | 0 | -2 | -0.4 | -3.1 | -0.2 | 4.3 | -3.7 |
| Jun-83 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 4.3 | -3.9 |
| Jul-83 | 0 | 0 | -1 | -0.1 | -1.2 | -0.1 | 4.4 | -3.7 |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.4 | -0.1 | 4.4 | -4.6 |
| Sep-83 | 0 | 0 | 1 | -0.1 | -0.9 | 0.0 | 4.1 | -4.8 |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 2.6 | -4.8 |
| Nov-83 | 0 | 0 | 0 | -0.1 | -0.5 | 0.0 | 2.3 | -4.7 |
| Dec-83 | 0 | 0 | 0 | -0.1 | 2.6 | 0.1 | 2.5 | -4.7 |
| Jan-84 | 0 | 0 | 3 | -0.5 | -1.6 | 0.2 | 2.9 | -4.6 |
| Feb-84 | 0 | 0 | 1 | -0.3 | -2.2 | 0.0 | 3.3 | -4.7 |
| Mar-84 | 0 | 0 | 0 | -0.3 | -2.4 | -0.1 | 3.5 | -4.7 |
| ***Apr-84*** | 188 | 0 | -1 | -0.2 | -2.2 | -0.1 | 3.6 | -4.7 |
| May-84 | 0 | 0 | -1 | -0.2 | -2.5 | -0.2 | 3.6 | -4.7 |
| ***Jun-84*** | 731 | 0 | -1 | -0.2 | -2.1 | -0.1 | 3.6 | -4.7 |
| ***Jul-84*** | 873 | 1535 | -4 | 0.5 | 4.4 | -0.1 | 3.7 | -4.6 |
| Aug-84 | 0 | 0 | -2 | -0.1 | -1.0 | -0.1 | 3.6 | -3.9 |
| Sep-84 | 0 | 0 | **24** | -0.1 | 2.8 | 1.0 | 2.8 | -3.8 |
| Oct-84 | 0 | 0 | 10 | -0.1 | -0.2 | 0.3 | 3.3 | -3.7 |
| Nov-84 | 0 | 0 | -20 | -0.1 | -5.9 | -0.9 | 3.7 | -3.7 |
| Dec-84 | 0 | 0 | -11 | -0.2 | -3.4 | -0.7 | 3.2 | -3.7 |
| ***Jan-85*** | 399 | 0 | 2 | -0.3 | -2.0 | 0.0 | 2.8 | -3.8 |
| ***Feb-85*** | 61 | 0 | 0 | -0.4 | -3.5 | -0.2 | 3.1 | -3.5 |
| Mar-85 | 0 | 0 | -2 | -0.5 | -4.5 | -0.3 | 3.1 | -3.5 |
| Apr-85 | 0 | 0 | -2 | -0.4 | -4.6 | -0.3 | 3.0 | -3.4 |
| May-85 | 0 | 0 | -2 | -0.3 | -3.3 | -0.2 | 3.0 | -3.4 |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.5 | -0.1 | 2.9 | -3.6 |
| ***Jul-85*** | 38 | 0 | 5 | -0.2 | -1.4 | 0.1 | 2.9 | -3.8 |
| Aug-85 | 0 | 0 | 10 | -0.1 | -0.4 | 0.3 | 3.4 | -4.9 |
| Sep-85 | 0 | 0 | 2 | -0.1 | -1.4 | 0.0 | 3.2 | -5.1 |
| Oct-85 | 0 | 0 | -1 | -0.1 | -2.7 | -0.2 | 1.3 | -5.1 |
| Nov-85 | 0 | 0 | -5 | -0.1 | -2.8 | -0.3 | 1.0 | -5.2 |
| Dec-85 | 0 | 0 | 0 | -0.2 | -2.7 | -0.2 | 0.9 | -5.3 |
| Jan-86 | 0 | 0 | 0 | -0.3 | -2.6 | -0.2 | 0.8 | -4.9 |
| Feb-86 | 0 | 0 | -2 | -0.7 | -4.3 | -0.3 | 0.9 | -4.7 |
| Mar-86 | 0 | 0 | 1 | -0.3 | -1.1 | 0.1 | 0.8 | -4.8 |
| Apr-86 | 0 | 0 | -1 | -0.3 | -2.0 | -0.1 | 0.9 | -4.9 |
| ***May-86*** | 290 | 0 | -1 | -0.1 | -1.3 | -0.1 | 0.9 | -4.9 |
| Jun-86 | 0 | 0 | -2 | -0.2 | -2.3 | -0.2 | 0.9 | -4.7 |
| ***Jul-86*** | 1637 | 1535 | -4 | 0.6 | 5.1 | -0.1 | 0.8 | -5.0 |
| Aug-86 | 0 | 0 | -2 | -0.2 | -2.7 | -0.2 | 0.6 | -3.9 |
| Sep-86 | 0 | 0 | **16** | -0.1 | 1.0 | 0.7 | 0.5 | -4.0 |
| Oct-86 | 0 | 0 | -30 | -0.1 | -6.3 | -1.3 | 1.2 | -4.0 |
| Nov-86 | 0 | 0 | -14 | -0.1 | -3.7 | -0.7 | 0.0 | -4.1 |

Table 2B-13 Monthly Average Water Quality Change at
Rock Slough: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Dec-86 | 0 | 0 | -6 | -0.2 | -3.7 | -0.4 | -0.5 | -4.1 |
| Jan-87 | 0 | 0 | -2 | -0.3 | -4.7 | -0.4 | -0.6 | -4.2 |
| Feb-87 | 0 | 0 | -13 | -0.4 | -8.7 | -0.9 | -0.7 | -4.2 |
| Mar-87 | 0 | 0 | -6 | -0.5 | -5.0 | -0.5 | -0.9 | -4.2 |
| Apr-87 | 0 | 0 | -2 | -0.4 | -3.1 | -0.2 | -1.0 | -4.3 |
| ***May-87*** | 414 | 0 | -1 | -0.3 | -2.5 | -0.2 | -1.0 | -4.3 |
| ***Jun-87*** | 517 | 0 | -1 | -0.2 | -2.4 | -0.1 | -1.0 | -4.3 |
| ***Jul-87*** | 54 | 5 | 3 | -0.2 | -1.6 | 0.1 | -1.0 | -4.4 |
| Aug-87 | 0 | 0 | 6 | -0.2 | -1.2 | 0.2 | -0.6 | -5.4 |
| Sep-87 | 0 | 0 | -1 | -0.1 | -2.7 | -0.2 | -0.2 | -5.6 |
| Oct-87 | 0 | 0 | -8 | -0.1 | -4.6 | -0.5 | -1.3 | -5.6 |
| Nov-87 | 0 | 0 | -9 | -0.2 | -4.1 | -0.5 | -1.8 | -5.7 |
| Dec-87 | 0 | 0 | 0 | -0.1 | -2.3 | -0.2 | -1.3 | -5.7 |
| Jan-88 | 0 | 0 | 1 | -0.3 | -2.1 | -0.1 | -1.1 | -5.7 |
| ***Feb-88*** | 139 | 0 | 1 | -0.4 | -2.2 | -0.1 | -1.1 | -5.6 |
| Mar-88 | 0 | 0 | 2 | -0.6 | -4.8 | -0.1 | -1.1 | -5.6 |
| Apr-88 | 0 | 0 | -1 | -0.5 | -5.1 | -0.3 | -1.0 | -5.7 |
| May-88 | 0 | 0 | -2 | -0.4 | -4.5 | -0.3 | -1.0 | -5.7 |
| Jun-88 | 0 | 0 | -2 | -0.4 | -4.8 | -0.3 | -1.0 | -5.7 |
| Jul-88 | 0 | 0 | -1 | -0.4 | -5.4 | -0.3 | -1.0 | -5.8 |
| Aug-88 | 0 | 0 | 4 | -0.4 | -4.5 | -0.1 | -1.3 | -6.0 |
| Sep-88 | 0 | 0 | 7 | -0.2 | -2.6 | 0.1 | -1.7 | -6.2 |
| Oct-88 | 0 | 0 | 10 | -0.2 | -2.3 | 0.1 | -1.8 | -6.3 |
| Nov-88 | 0 | 0 | **10** | -0.2 | -1.3 | 0.2 | -1.4 | -6.3 |
| Dec-88 | 0 | 0 | 8 | -0.2 | -1.7 | 0.1 | -0.9 | -6.4 |
| Jan-89 | 0 | 0 | 3 | -0.3 | -3.6 | -0.2 | -0.8 | -6.4 |
| Feb-89 | 0 | 0 | 3 | -0.6 | -6.9 | -0.4 | -0.7 | -6.4 |
| Mar-89 | 0 | 0 | 0 | -0.3 | -2.4 | -0.1 | -0.6 | -6.6 |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.7 | -0.1 | -0.6 | -6.7 |
| May-89 | 0 | 0 | -2 | -0.3 | -2.4 | -0.2 | -0.7 | -6.7 |
| ***Jun-89*** | 60 | 0 | -1 | -0.2 | -2.6 | -0.2 | -0.7 | -6.7 |
| ***Jul-89*** | 105 | 0 | 3 | -0.2 | -2.4 | 0.0 | -0.7 | -6.9 |
| Aug-89 | 0 | 0 | 6 | -0.2 | -1.4 | 0.2 | -0.2 | -8.4 |
| Sep-89 | 0 | 0 | 5 | -0.1 | -1.0 | 0.1 | 0.4 | -8.4 |
| Oct-89 | 0 | 0 | -6 | -0.1 | -3.8 | -0.4 | 0.0 | -8.4 |
| Nov-89 | 0 | 0 | -2 | -0.1 | -2.6 | -0.2 | 0.6 | -8.4 |
| Dec-89 | 0 | 0 | -1 | -0.2 | -3.2 | -0.3 | 1.1 | -8.4 |
| Jan-90 | 0 | 0 | -6 | -0.3 | -5.0 | -0.5 | 1.2 | -8.4 |
| Feb-90 | 0 | 0 | -2 | -0.4 | -4.5 | -0.4 | 1.1 | -8.4 |
| Mar-90 | 0 | 0 | -1 | -0.4 | -3.7 | -0.2 | 1.3 | -8.3 |
| Apr-90 | 0 | 0 | -2 | -0.7 | -1.0 | -0.2 | 1.3 | -8.4 |
| May-90 | 0 | 0 | -2 | -0.3 | 3.0 | 0.0 | 1.3 | -8.4 |
| Jun-90 | 0 | 0 | -5 | -0.4 | -5.6 | -0.4 | 1.3 | -8.3 |
| Jul-90 | 0 | 0 | 0 | -0.5 | -6.3 | -0.3 | 1.2 | -8.4 |
| Aug-90 | 0 | 0 | 5 | -0.4 | -4.9 | -0.1 | 1.1 | -8.7 |
| Sep-90 | 0 | 0 | -3 | -0.2 | -4.5 | -0.3 | 0.9 | -8.9 |
| Oct-90 | 0 | 0 | -2 | -0.2 | -5.7 | -0.4 | 0.9 | -9.0 |
| Nov-90 | 0 | 0 | 3 | -0.2 | -2.6 | -0.1 | 1.0 | -9.0 |
| Dec-90 | 0 | 0 | 3 | -0.3 | -2.8 | -0.1 | 1.1 | -9.0 |
| Jan-91 | 0 | 0 | -4 | -0.5 | -8.6 | -0.7 | 1.2 | -9.0 |
| Feb-91 | 0 | 0 | -10 | -0.9 | -16.9 | -1.3 | 1.1 | -9.3 |
| Mar-91 | 0 | 0 | -3 | -0.5 | -4.6 | -0.4 | 0.8 | -9.7 |
| Apr-91 | 0 | 0 | -1 | -0.3 | -2.2 | -0.2 | 0.7 | -9.6 |
| May-91 | 0 | 0 | -1 | -0.3 | 3.1 | 0.0 | 0.7 | -9.4 |
| Jun-91 | 0 | 0 | -2 | -0.4 | -5.4 | -0.3 | 0.7 | -9.3 |
| Jul-91 | 0 | 0 | 0 | -0.4 | -5.5 | -0.2 | 0.7 | -9.3 |
| Aug-91 | 0 | 0 | 6 | -0.4 | -4.9 | 0.0 | 0.7 | -9.4 |
| Sep-91 | 0 | 0 | 8 | -0.2 | -1.8 | 0.1 | 0.8 | -9.5 |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-14 Monthly Average Water Quality Change at
Los Vaqueros Reservoir Intake: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Oct-75 | 0 | 0 | **12** | -0.1 | 0.1 | 0.4 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | -6 | -0.1 | -1.8 | -0.4 | n/a | n/a |
| Dec-75 | 0 | 0 | -10 | -0.1 | -2.7 | -0.5 | n/a | n/a |
| Jan-76 | 0 | 0 | -21 | -0.3 | -6.9 | -1.1 | n/a | n/a |
| Feb-76 | 0 | 0 | -21 | -0.4 | -10.3 | -1.3 | n/a | n/a |
| Mar-76 | 0 | 0 | -9 | -0.5 | -7.9 | -0.7 | n/a | n/a |
| Apr-76 | 0 | 0 | 2 | -0.4 | -5.2 | 0.0 | n/a | n/a |
| May-76 | 0 | 0 | 0 | -0.3 | -4.4 | -0.2 | n/a | n/a |
| Jun-76 | 0 | 0 | -1 | -0.3 | -4.0 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 2 | -0.3 | -3.5 | 0.0 | n/a | n/a |
| Aug-76 | 0 | 0 | 7 | -0.2 | -2.0 | 0.2 | n/a | n/a |
| Sep-76 | 0 | 0 | 0 | -0.1 | -0.7 | -0.1 | n/a | n/a |
| Oct-76 | 0 | 0 | 1 | -0.2 | -0.9 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 3 | -0.2 | -1.7 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 2 | -0.3 | -3.4 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 3 | -0.5 | -5.9 | -0.3 | n/a | n/a |
| Feb-77 | 0 | 0 | 0 | -0.6 | 0.0 | -0.1 | n/a | n/a |
| Mar-77 | 0 | 0 | 2 | -0.7 | -11.2 | -0.4 | n/a | n/a |
| Apr-77 | 0 | 0 | 3 | -0.6 | -0.3 | 0.1 | n/a | n/a |
| May-77 | 0 | 0 | 0 | -0.4 | -6.4 | -0.2 | n/a | n/a |
| Jun-77 | 0 | 0 | 0 | -0.5 | -6.5 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 2 | -0.4 | -4.7 | -0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 1 | -0.3 | -3.2 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 3 | -0.2 | -1.8 | 0.0 | n/a | n/a |
| Oct-77 | 0 | 0 | -1 | -0.2 | -1.7 | -0.3 | n/a | n/a |
| Nov-77 | 0 | 0 | 2 | -0.2 | -2.3 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 6 | -0.3 | -5.1 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | -3 | -0.7 | -5.2 | -0.4 | n/a | n/a |
| Feb-78 | 0 | 0 | -8 | -1.2 | -8.1 | -0.8 | n/a | n/a |
| Mar-78 | 0 | 0 | -3 | -1.0 | -5.9 | -0.4 | n/a | n/a |
| Apr-78 | 0 | 0 | -1 | -0.3 | -2.7 | -0.1 | n/a | n/a |
| May-78 | 0 | 0 | -1 | -0.1 | -1.2 | -0.1 | n/a | n/a |
| Jun-78 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 1 | 0.6 | 5.1 | 0.2 | n/a | n/a |
| Aug-78 | 0 | 0 | 5 | 0.0 | 1.1 | 0.3 | n/a | n/a |
| Sep-78 | 0 | 0 | **20** | 0.0 | 3.1 | 0.9 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 6 | -0.1 | 1.4 | 0.2 | n/a | n/a |
| Nov-78 | 0 | 0 | 1 | -0.1 | -0.3 | 0.0 | n/a | n/a |
| Dec-78 | 0 | 0 | 6 | -0.1 | -0.7 | 0.1 | n/a | n/a |
| Jan-79 | 0 | 0 | 5 | -0.4 | -3.4 | 0.0 | n/a | n/a |
| Feb-79 | 0 | 0 | -5 | -1.0 | -7.9 | -0.6 | n/a | n/a |
| Mar-79 | 0 | 0 | -4 | -0.7 | -5.6 | -0.4 | n/a | n/a |
| Apr-79 | 0 | 0 | -1 | -0.2 | -2.5 | -0.1 | n/a | n/a |
| May-79 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | n/a | n/a |
| ***Jun-79*** | 350 | 0 | -1 | -0.1 | -1.1 | -0.1 | n/a | n/a |
| ***Jul-79*** | 1415 | 1558 | 0 | 0.5 | 5.1 | 0.1 | n/a | n/a |
| Aug-79 | 0 | 0 | 6 | 0.0 | 0.8 | 0.4 | n/a | n/a |
| Sep-79 | 0 | 0 | **22** | -0.1 | 2.1 | 0.9 | n/a | n/a |
| Oct-79 | 0 | 0 | **19** | -0.1 | 1.2 | 0.6 | n/a | n/a |
| Nov-79 | 0 | 0 | 4 | -0.1 | -1.3 | 0.1 | n/a | n/a |
| Dec-79 | 0 | 0 | **11** | -0.2 | -2.8 | 0.4 | n/a | n/a |
| Jan-80 | 0 | 0 | 0 | -0.7 | -5.7 | -0.2 | n/a | n/a |
| Feb-80 | 0 | 0 | 7 | 0.2 | 0.9 | 0.6 | n/a | n/a |
| Mar-80 | 0 | 0 | 1 | -0.4 | -2.2 | 0.1 | n/a | n/a |
| Apr-80 | 0 | 0 | -1 | -0.3 | -3.2 | -0.1 | n/a | n/a |
| May-80 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | n/a | n/a |
| Jun-80 | 0 | 0 | -1 | -0.2 | -1.7 | -0.1 | n/a | n/a |
| ***Jul-80*** | 1844 | 1601 | -2 | 0.6 | 4.7 | 0.0 | n/a | n/a |
| Aug-80 | 0 | 0 | 3 | 0.0 | 0.2 | 0.2 | n/a | n/a |
| Sep-80 | 0 | 0 | **22** | -0.1 | 2.3 | 1.0 | n/a | n/a |
| ***Oct-80*** | 49 | 0 | 8 | -0.1 | 1.0 | 0.3 | n/a | n/a |
| Nov-80 | 0 | 0 | -2 | -0.1 | -0.6 | -0.1 | n/a | n/a |
| Dec-80 | 0 | 0 | -6 | -0.1 | -1.1 | -0.3 | n/a | n/a |
| Jan-81 | 0 | 0 | -7 | -0.2 | -3.9 | -0.5 | n/a | n/a |
| Feb-81 | 0 | 0 | -7 | -0.4 | -6.1 | -0.6 | n/a | n/a |
| Mar-81 | 0 | 0 | -2 | -0.5 | -0.1 | -0.1 | n/a | n/a |
| Apr-81 | 0 | 0 | -3 | -0.4 | -3.9 | -0.3 | n/a | n/a |

Table 2B-14 Monthly Average Water Quality Change at
Los Vaqueros Reservoir Intake: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| ***May-81*** | 19 | 0 | -1 | -0.2 | -2.8 | -0.1 | n/a | n/a |
| ***Jun-81*** | 439 | 0 | -1 | -0.2 | -2.5 | -0.1 | n/a | n/a |
| ***Jul-81*** | 664 | 263 | -1 | 0.0 | 0.6 | -0.1 | n/a | n/a |
| Aug-81 | 0 | 0 | 6 | -0.1 | 0.6 | 0.2 | n/a | n/a |
| Sep-81 | 0 | 0 | **15** | -0.1 | 1.4 | 0.6 | n/a | n/a |
| Oct-81 | 0 | 0 | 6 | -0.1 | 1.1 | 0.1 | n/a | n/a |
| Nov-81 | 0 | 0 | -7 | -0.1 | -1.2 | -0.4 | n/a | n/a |
| Dec-81 | 0 | 0 | -4 | -0.2 | -1.8 | -0.3 | n/a | n/a |
| Jan-82 | 0 | 0 | -5 | -0.9 | -5.4 | -0.5 | n/a | n/a |
| Feb-82 | 0 | 0 | -1 | -0.4 | -2.7 | -0.1 | n/a | n/a |
| Mar-82 | 0 | 0 | -1 | -1.3 | -8.9 | -0.4 | n/a | n/a |
| Apr-82 | 0 | 0 | 0 | -0.4 | -2.4 | -0.1 | n/a | n/a |
| May-82 | 0 | 0 | 0 | -0.2 | 3.3 | -0.1 | n/a | n/a |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.2 | -0.1 | n/a | n/a |
| ***Jul-82*** | 1636 | 1613 | -5 | 0.6 | 4.0 | -0.2 | n/a | n/a |
| Aug-82 | 0 | 0 | 4 | -0.1 | 0.2 | 0.2 | n/a | n/a |
| Sep-82 | 0 | 0 | **26** | -0.1 | 3.1 | 1.2 | n/a | n/a |
| Oct-82 | 0 | 0 | 5 | 0.0 | 0.2 | 0.3 | n/a | n/a |
| Nov-82 | 0 | 0 | -2 | -0.1 | -1.0 | -0.2 | n/a | n/a |
| Dec-82 | 0 | 0 | -9 | -0.5 | -0.5 | -0.6 | n/a | n/a |
| Jan-83 | 0 | 0 | 1 | 0.0 | 0.1 | 0.1 | n/a | n/a |
| Feb-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | n/a | n/a |
| Mar-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | n/a | n/a |
| Apr-83 | 0 | 0 | 0 | -0.3 | -2.0 | -0.1 | n/a | n/a |
| May-83 | 0 | 0 | -1 | -0.4 | -3.0 | -0.1 | n/a | n/a |
| Jun-83 | 0 | 0 | 0 | -0.1 | -0.9 | 0.0 | n/a | n/a |
| Jul-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | n/a | n/a |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.2 | -0.1 | n/a | n/a |
| Sep-83 | 0 | 0 | 1 | -0.1 | -0.8 | 0.0 | n/a | n/a |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | n/a | n/a |
| Nov-83 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | n/a | n/a |
| Dec-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | n/a | n/a |
| Jan-84 | 0 | 0 | 0 | -0.4 | -1.4 | -0.2 | n/a | n/a |
| Feb-84 | 0 | 0 | 1 | -0.4 | 1.0 | 0.1 | n/a | n/a |
| Mar-84 | 0 | 0 | 0 | -0.3 | -2.7 | -0.1 | n/a | n/a |
| ***Apr-84*** | 188 | 0 | -1 | -0.2 | -1.8 | -0.1 | n/a | n/a |
| May-84 | 0 | 0 | -1 | -0.2 | -2.3 | -0.1 | n/a | n/a |
| ***Jun-84*** | 731 | 0 | -2 | 0.0 | -1.1 | -0.2 | n/a | n/a |
| ***Jul-84*** | 873 | 1535 | -5 | 0.4 | 2.8 | -0.2 | n/a | n/a |
| Aug-84 | 0 | 0 | -2 | -0.1 | 0.5 | -0.1 | n/a | n/a |
| Sep-84 | 0 | 0 | **19** | -0.1 | 3.1 | 0.8 | n/a | n/a |
| Oct-84 | 0 | 0 | 10 | -0.1 | 3.2 | 0.3 | n/a | n/a |
| Nov-84 | 0 | 0 | -16 | -0.1 | -0.3 | -0.8 | n/a | n/a |
| Dec-84 | 0 | 0 | -11 | -0.2 | -1.8 | -0.7 | n/a | n/a |
| ***Jan-85*** | 399 | 0 | 1 | -0.3 | 1.9 | 0.1 | n/a | n/a |
| ***Feb-85*** | 61 | 0 | 0 | -0.4 | 1.0 | 0.1 | n/a | n/a |
| Mar-85 | 0 | 0 | -1 | -0.5 | 0.0 | 0.0 | n/a | n/a |
| Apr-85 | 0 | 0 | -2 | -0.4 | 2.0 | -0.1 | n/a | n/a |
| May-85 | 0 | 0 | -1 | -0.3 | -2.9 | -0.2 | n/a | n/a |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.6 | -0.1 | n/a | n/a |
| ***Jul-85*** | 38 | 0 | 4 | -0.2 | -1.5 | 0.1 | n/a | n/a |
| Aug-85 | 0 | 0 | 8 | -0.1 | -1.6 | 0.3 | n/a | n/a |
| Sep-85 | 0 | 0 | 3 | -0.1 | -2.7 | 0.0 | n/a | n/a |
| Oct-85 | 0 | 0 | 0 | -0.1 | -2.2 | -0.1 | n/a | n/a |
| Nov-85 | 0 | 0 | -4 | -0.1 | -1.0 | -0.3 | n/a | n/a |
| Dec-85 | 0 | 0 | 0 | -0.2 | -1.8 | -0.2 | n/a | n/a |
| Jan-86 | 0 | 0 | 0 | -0.3 | -2.5 | -0.1 | n/a | n/a |
| Feb-86 | 0 | 0 | 1 | -0.6 | -4.2 | 0.0 | n/a | n/a |
| Mar-86 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | n/a | n/a |
| Apr-86 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | n/a | n/a |
| ***May-86*** | 290 | 0 | 0 | 0.0 | 0.1 | 0.0 | n/a | n/a |
| Jun-86 | 0 | 0 | -1 | -0.2 | -2.0 | -0.1 | n/a | n/a |
| ***Jul-86*** | 1637 | 1535 | -8 | ***1.0*** | 0.9 | -0.5 | n/a | n/a |
| Aug-86 | 0 | 0 | -7 | -0.2 | -4.0 | -0.5 | n/a | n/a |
| Sep-86 | 0 | 0 | **12** | -0.1 | 1.2 | 0.5 | n/a | n/a |
| Oct-86 | 0 | 0 | -21 | -0.1 | 1.4 | -1.0 | n/a | n/a |
| Nov-86 | 0 | 0 | -12 | -0.1 | -0.6 | -0.6 | n/a | n/a |

Table 2B-14 Monthly Average Water Quality Change at
Los Vaqueros Reservoir Intake: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Dec-86 | 0 | 0 | -5 | -0.2 | -1.8 | -0.4 | n/a | n/a |
| Jan-87 | 0 | 0 | -2 | -0.4 | -4.1 | -0.4 | n/a | n/a |
| Feb-87 | 0 | 0 | -9 | -0.4 | -4.8 | -0.3 | n/a | n/a |
| Mar-87 | 0 | 0 | -8 | -0.6 | -8.2 | -0.7 | n/a | n/a |
| Apr-87 | 0 | 0 | -3 | -0.4 | -4.4 | -0.3 | n/a | n/a |
| ***May-87*** | 414 | 0 | -2 | -0.2 | -3.1 | -0.2 | n/a | n/a |
| ***Jun-87*** | 517 | 0 | 0 | -0.1 | -1.9 | 0.0 | n/a | n/a |
| ***Jul-87*** | 54 | 5 | 2 | -0.2 | -1.2 | 0.1 | n/a | n/a |
| Aug-87 | 0 | 0 | 5 | -0.2 | -0.8 | 0.1 | n/a | n/a |
| Sep-87 | 0 | 0 | 0 | -0.1 | -1.4 | -0.1 | n/a | n/a |
| Oct-87 | 0 | 0 | -5 | -0.1 | -1.1 | -0.3 | n/a | n/a |
| Nov-87 | 0 | 0 | -7 | -0.2 | -1.6 | -0.4 | n/a | n/a |
| Dec-87 | 0 | 0 | -1 | -0.2 | -1.4 | -0.2 | n/a | n/a |
| Jan-88 | 0 | 0 | 1 | -0.3 | -1.9 | -0.1 | n/a | n/a |
| ***Feb-88*** | 139 | 0 | 1 | -0.5 | -3.5 | -0.1 | n/a | n/a |
| Mar-88 | 0 | 0 | 1 | -0.7 | -5.3 | -0.1 | n/a | n/a |
| Apr-88 | 0 | 0 | -1 | -0.5 | 0.2 | 0.0 | n/a | n/a |
| May-88 | 0 | 0 | -1 | -0.4 | -4.3 | -0.2 | n/a | n/a |
| Jun-88 | 0 | 0 | -1 | -0.4 | 2.4 | 0.0 | n/a | n/a |
| Jul-88 | 0 | 0 | -1 | -0.5 | -5.4 | -0.3 | n/a | n/a |
| Aug-88 | 0 | 0 | 2 | -0.4 | -4.4 | -0.1 | n/a | n/a |
| Sep-88 | 0 | 0 | 5 | -0.2 | -2.1 | 0.0 | n/a | n/a |
| Oct-88 | 0 | 0 | 7 | -0.2 | -1.9 | 0.1 | n/a | n/a |
| Nov-88 | 0 | 0 | 7 | -0.2 | -1.4 | 0.1 | n/a | n/a |
| Dec-88 | 0 | 0 | 7 | -0.2 | -1.8 | 0.1 | n/a | n/a |
| Jan-89 | 0 | 0 | 4 | -0.3 | -3.5 | -0.1 | n/a | n/a |
| Feb-89 | 0 | 0 | 3 | -0.6 | -6.7 | -0.2 | n/a | n/a |
| Mar-89 | 0 | 0 | 0 | -0.4 | -3.1 | -0.1 | n/a | n/a |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.8 | -0.1 | n/a | n/a |
| May-89 | 0 | 0 | -1 | -0.3 | -2.6 | -0.1 | n/a | n/a |
| ***Jun-89*** | 60 | 0 | -2 | -0.2 | -2.6 | -0.2 | n/a | n/a |
| ***Jul-89*** | 105 | 0 | 2 | -0.3 | -2.7 | 0.0 | n/a | n/a |
| Aug-89 | 0 | 0 | 5 | -0.2 | -1.7 | 0.1 | n/a | n/a |
| Sep-89 | 0 | 0 | 4 | -0.1 | 0.1 | 0.1 | n/a | n/a |
| Oct-89 | 0 | 0 | -4 | -0.1 | 0.0 | -0.3 | n/a | n/a |
| Nov-89 | 0 | 0 | -1 | -0.2 | -1.5 | -0.2 | n/a | n/a |
| Dec-89 | 0 | 0 | 0 | -0.2 | -2.6 | -0.2 | n/a | n/a |
| Jan-90 | 0 | 0 | -5 | -0.3 | -2.4 | -0.5 | n/a | n/a |
| Feb-90 | 0 | 0 | -2 | -0.5 | -4.0 | -0.3 | n/a | n/a |
| Mar-90 | 0 | 0 | 0 | -0.4 | -3.6 | -0.1 | n/a | n/a |
| Apr-90 | 0 | 0 | -1 | -0.6 | -5.7 | -0.3 | n/a | n/a |
| May-90 | 0 | 0 | -1 | -0.4 | -4.0 | -0.2 | n/a | n/a |
| Jun-90 | 0 | 0 | -3 | -0.4 | -4.3 | -0.3 | n/a | n/a |
| Jul-90 | 0 | 0 | -2 | -0.6 | 0.5 | -0.1 | n/a | n/a |
| Aug-90 | 0 | 0 | 2 | -0.4 | 2.9 | 0.2 | n/a | n/a |
| Sep-90 | 0 | 0 | 0 | -0.2 | -1.6 | -0.2 | n/a | n/a |
| Oct-90 | 0 | 0 | -2 | -0.2 | -1.6 | -0.3 | n/a | n/a |
| Nov-90 | 0 | 0 | 2 | -0.2 | -1.9 | -0.1 | n/a | n/a |
| Dec-90 | 0 | 0 | 2 | -0.3 | -2.5 | -0.1 | n/a | n/a |
| Jan-91 | 0 | 0 | -2 | -0.5 | -5.4 | -0.5 | n/a | n/a |
| Feb-91 | 0 | 0 | -5 | -0.9 | -3.2 | -0.5 | n/a | n/a |
| Mar-91 | 0 | 0 | -3 | -0.5 | -4.8 | -0.4 | n/a | n/a |
| Apr-91 | 0 | 0 | -1 | -0.3 | -2.6 | -0.1 | n/a | n/a |
| May-91 | 0 | 0 | -1 | -0.3 | -2.7 | -0.1 | n/a | n/a |
| Jun-91 | 0 | 0 | -1 | -0.4 | 1.6 | 0.0 | n/a | n/a |
| Jul-91 | 0 | 0 | -1 | -0.5 | 0.6 | 0.0 | n/a | n/a |
| Aug-91 | 0 | 0 | 2 | -0.5 | 2.8 | 0.2 | n/a | n/a |
| Sep-91 | 0 | 0 | 6 | -0.2 | -1.7 | 0.1 | n/a | n/a |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-15 Monthly Average Water Quality Change at
Banks Pumping Plant
Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Oct-75 | 0 | 0 | 9 | -0.1 | 0.4 | 0.3 | n/a | n/a |
| **Nov-75** | 49 | 0 | -4 | -0.1 | -1.1 | -0.2 | n/a | n/a |
| Dec-75 | 0 | 0 | -7 | -0.1 | -2.2 | -0.4 | n/a | n/a |
| Jan-76 | 0 | 0 | -14 | -0.2 | -4.6 | -0.8 | n/a | n/a |
| Feb-76 | 0 | 0 | -15 | -0.3 | -7.1 | -0.9 | n/a | n/a |
| Mar-76 | 0 | 0 | -7 | -0.4 | -5.8 | -0.6 | n/a | n/a |
| Apr-76 | 0 | 0 | 7 | -0.4 | -2.8 | 0.1 | n/a | n/a |
| May-76 | 0 | 0 | 0 | -0.3 | -3.6 | -0.1 | n/a | n/a |
| Jun-76 | 0 | 0 | -1 | -0.3 | -3.9 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 1 | -0.3 | -3.4 | -0.1 | n/a | n/a |
| Aug-76 | 0 | 0 | 5 | -0.2 | -1.7 | 0.1 | n/a | n/a |
| Sep-76 | 0 | 0 | 1 | -0.1 | -1.2 | 0.0 | n/a | n/a |
| Oct-76 | 0 | 0 | 0 | -0.1 | -2.0 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 2 | -0.1 | -1.3 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 0 | -0.2 | -1.7 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 2 | -0.4 | -3.8 | -0.2 | n/a | n/a |
| Feb-77 | 0 | 0 | 0 | -0.5 | 2.4 | 0.1 | n/a | n/a |
| Mar-77 | 0 | 0 | 0 | -0.2 | -3.1 | -0.2 | n/a | n/a |
| Apr-77 | 0 | 0 | 2 | -0.4 | -4.8 | -0.2 | n/a | n/a |
| May-77 | 0 | 0 | 1 | -0.4 | -5.0 | -0.2 | n/a | n/a |
| Jun-77 | 0 | 0 | 0 | -0.4 | -6.2 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 1 | -0.4 | 2.6 | 0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 1 | -0.3 | -3.8 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 2 | -0.2 | -2.4 | 0.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 0 | -0.2 | -3.8 | -0.2 | n/a | n/a |
| Nov-77 | 0 | 0 | 2 | -0.2 | -2.2 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 4 | -0.2 | -2.2 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | -1 | -0.6 | -3.7 | -0.3 | n/a | n/a |
| Feb-78 | 0 | 0 | -2 | -0.6 | -3.3 | -0.3 | n/a | n/a |
| Mar-78 | 0 | 0 | -1 | -0.4 | -2.4 | -0.2 | n/a | n/a |
| Apr-78 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | n/a | n/a |
| May-78 | 0 | 0 | 0 | -0.1 | -0.9 | 0.0 | n/a | n/a |
| Jun-78 | 0 | 0 | -1 | -0.1 | -1.1 | -0.1 | n/a | n/a |
| **Jul-78** | 1844 | 1617 | 1 | **0.7** | 1.3 | 0.1 | n/a | n/a |
| Aug-78 | 0 | 0 | 4 | 0.1 | 1.4 | 0.3 | n/a | n/a |
| Sep-78 | 0 | 0 | **15** | 0.0 | 2.7 | 0.7 | n/a | n/a |
| **Oct-78** | 28 | 0 | 5 | -0.1 | 0.2 | 0.2 | 0.7 | -2.3 |
| Nov-78 | 0 | 0 | 1 | -0.1 | -0.8 | 0.0 | -0.4 | -2.6 |
| Dec-78 | 0 | 0 | 3 | -0.1 | -0.6 | 0.1 | 0.7 | -2.0 |
| Jan-79 | 0 | 0 | 4 | -0.3 | 3.4 | 0.3 | 0.2 | -2.5 |
| Feb-79 | 0 | 0 | -1 | -0.4 | -2.2 | -0.2 | 1.7 | -2.3 |
| Mar-79 | 0 | 0 | -1 | -0.3 | -1.9 | -0.2 | 2.2 | -2.1 |
| Apr-79 | 0 | 0 | 0 | -0.2 | 3.4 | 0.1 | 1.6 | -2.4 |
| May-79 | 0 | 0 | 0 | -0.1 | -1.3 | -0.1 | 1.9 | -1.9 |
| **Jun-79** | 350 | 0 | -1 | 0.0 | -0.2 | 0.0 | 1.8 | -2.0 |
| **Jul-79** | 1415 | 1558 | 0 | 0.6 | 5.3 | 0.2 | 2.0 | -1.6 |
| Aug-79 | 0 | 0 | 5 | 0.0 | 0.9 | 0.3 | 2.7 | 0.4 |
| Sep-79 | 0 | 0 | **16** | -0.1 | 1.9 | 0.7 | 2.2 | 0.0 |
| Oct-79 | 0 | 0 | **14** | -0.1 | 1.1 | 0.5 | 3.9 | 0.4 |
| Nov-79 | 0 | 0 | 3 | -0.1 | -0.5 | 0.1 | 4.2 | 0.4 |
| Dec-79 | 0 | 0 | 8 | -0.1 | -0.1 | 0.3 | 4.5 | 0.5 |
| Jan-80 | 0 | 0 | 2 | -0.1 | -0.3 | 0.1 | 4.3 | 0.1 |
| Feb-80 | 0 | 0 | 0 | 0.0 | -0.2 | 0.0 | 4.5 | 0.0 |
| Mar-80 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | 4.6 | 0.6 |
| Apr-80 | 0 | 0 | 0 | -0.1 | -1.3 | -0.1 | 4.9 | 0.7 |
| May-80 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | ***5.1*** | 0.9 |
| Jun-80 | 0 | 0 | -1 | -0.1 | -1.3 | -0.1 | 5.0 | 0.8 |
| **Jul-80** | 1844 | 1601 | -4 | **0.7** | -0.4 | -0.2 | 4.9 | 0.7 |
| Aug-80 | 0 | 0 | 2 | 0.0 | -0.2 | 0.1 | ***5.6*** | 2.5 |
| Sep-80 | 0 | 0 | **16** | -0.1 | 1.9 | 0.7 | ***5.4*** | 2.4 |
| **Oct-80** | 49 | 0 | 7 | -0.1 | 0.6 | 0.3 | ***6.5*** | 2.5 |
| Nov-80 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | ***6.2*** | 2.2 |
| Dec-80 | 0 | 0 | -3 | -0.1 | -1.2 | -0.2 | ***6.2*** | 2.3 |
| Jan-81 | 0 | 0 | -5 | -0.2 | -2.6 | -0.4 | ***5.1*** | 2.0 |
| Feb-81 | 0 | 0 | -4 | -0.3 | -3.4 | -0.4 | 4.9 | 2.8 |
| Mar-81 | 0 | 0 | -2 | -0.3 | 2.4 | 0.0 | 5.0 | 2.9 |
| Apr-81 | 0 | 0 | -3 | -0.4 | -4.1 | -0.3 | 4.8 | 2.7 |

Table 2B-15 Monthly Average Water Quality Change at
Banks Pumping Plant
Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| ***May-81*** | 19 | 0 | -1 | -0.2 | -2.3 | -0.1 | 4.8 | 2.9 |
| ***Jun-81*** | 439 | 0 | -1 | -0.1 | -1.1 | -0.1 | 4.8 | 3.0 |
| ***Jul-81*** | 664 | 263 | -1 | 0.1 | 0.6 | 0.0 | 4.9 | 3.3 |
| Aug-81 | 0 | 0 | 4 | -0.1 | -0.9 | 0.1 | 4.1 | 1.4 |
| Sep-81 | 0 | 0 | **11** | -0.1 | 0.8 | 0.4 | 4.7 | 2.0 |
| Oct-81 | 0 | 0 | 6 | -0.1 | -0.3 | 0.2 | 4.1 | 1.9 |
| Nov-81 | 0 | 0 | -5 | -0.1 | -2.2 | -0.3 | 3.9 | 1.9 |
| Dec-81 | 0 | 0 | -3 | -0.1 | -1.4 | -0.2 | 3.7 | 2.0 |
| Jan-82 | 0 | 0 | -2 | -0.5 | -2.7 | -0.2 | 4.6 | 2.3 |
| Feb-82 | 0 | 0 | 0 | -0.2 | -0.6 | 0.0 | 4.3 | 2.0 |
| Mar-82 | 0 | 0 | 0 | -0.1 | -0.9 | 0.0 | 4.2 | 1.9 |
| Apr-82 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 4.3 | 2.0 |
| May-82 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | 4.1 | 1.8 |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 4.2 | 1.7 |
| ***Jul-82*** | 1636 | 1613 | -7 | **0.6** | -1.4 | -0.4 | 4.0 | 1.4 |
| Aug-82 | 0 | 0 | 1 | -0.1 | -0.5 | 0.0 | 4.1 | 1.8 |
| Sep-82 | 0 | 0 | **19** | -0.1 | 2.3 | 0.8 | 4.9 | 2.6 |
| Oct-82 | 0 | 0 | 3 | 0.0 | 0.2 | 0.2 | **5.0** | 2.2 |
| Nov-82 | 0 | 0 | -1 | -0.1 | -0.8 | -0.1 | 4.7 | 1.8 |
| Dec-82 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 4.1 | 1.1 |
| Jan-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 3.8 | 1.0 |
| Feb-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 3.7 | 1.2 |
| Mar-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 3.6 | 0.8 |
| Apr-83 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.6 | 0.7 |
| May-83 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.6 | 0.6 |
| Jun-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 3.7 | 0.7 |
| Jul-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 3.7 | 0.6 |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 2.8 | -1.2 |
| Sep-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 2.6 | -1.1 |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | 1.8 | -1.2 |
| Nov-83 | 0 | 0 | 0 | 0.0 | -0.3 | 0.0 | 2.0 | -1.0 |
| Dec-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 2.0 | -1.1 |
| Jan-84 | 0 | 0 | 0 | -0.1 | -0.3 | 0.0 | 3.4 | -0.7 |
| Feb-84 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | 4.0 | -0.6 |
| Mar-84 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 4.0 | -0.7 |
| ***Apr-84*** | 188 | 0 | -2 | -0.1 | -1.1 | -0.1 | 4.3 | -0.5 |
| May-84 | 0 | 0 | -1 | -0.2 | -1.9 | -0.1 | 4.3 | -0.4 |
| ***Jun-84*** | 731 | 0 | -4 | 0.1 | 0.1 | -0.2 | 4.3 | -0.4 |
| ***Jul-84*** | 873 | 1535 | -6 | 0.4 | 2.7 | -0.3 | 4.2 | -0.4 |
| Aug-84 | 0 | 0 | -2 | -0.1 | -0.9 | -0.1 | 4.7 | 0.6 |
| Sep-84 | 0 | 0 | **12** | 0.0 | 1.8 | 0.6 | 3.8 | 0.3 |
| Oct-84 | 0 | 0 | 8 | -0.1 | 0.5 | 0.3 | 3.8 | 0.2 |
| Nov-84 | 0 | 0 | -13 | -0.1 | -3.9 | -0.7 | 4.8 | 0.3 |
| Dec-84 | 0 | 0 | -9 | -0.2 | -2.9 | -0.6 | 3.9 | 0.3 |
| ***Jan-85*** | 399 | 0 | -1 | -0.2 | -1.5 | -0.1 | 3.2 | 0.3 |
| ***Feb-85*** | 61 | 0 | 1 | -0.3 | 3.3 | 0.2 | 3.6 | 0.7 |
| Mar-85 | 0 | 0 | -1 | -0.4 | 2.4 | 0.1 | 3.3 | 0.6 |
| Apr-85 | 0 | 0 | -2 | -0.3 | 2.9 | 0.0 | 3.3 | 0.6 |
| May-85 | 0 | 0 | -1 | -0.2 | -2.9 | -0.2 | 3.3 | 0.6 |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.4 | -0.1 | 3.3 | 0.6 |
| ***Jul-85*** | 38 | 0 | 3 | -0.2 | -1.4 | 0.1 | 3.3 | 0.7 |
| Aug-85 | 0 | 0 | 6 | -0.1 | -0.5 | 0.2 | 2.3 | -1.6 |
| Sep-85 | 0 | 0 | 3 | -0.1 | -0.7 | 0.1 | 2.0 | -2.1 |
| Oct-85 | 0 | 0 | 0 | -0.1 | -1.7 | -0.1 | -0.1 | -2.2 |
| Nov-85 | 0 | 0 | -2 | -0.1 | -1.8 | -0.2 | -0.5 | -1.9 |
| Dec-85 | 0 | 0 | 0 | -0.2 | -1.8 | -0.1 | -0.1 | -1.3 |
| Jan-86 | 0 | 0 | 0 | -0.3 | -1.8 | -0.1 | 0.0 | -1.1 |
| Feb-86 | 0 | 0 | 0 | -0.3 | -1.4 | -0.1 | 0.0 | -1.4 |
| Mar-86 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 0.2 | -1.0 |
| Apr-86 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 0.2 | -0.8 |
| ***May-86*** | 290 | 0 | 0 | 0.1 | 1.0 | 0.0 | 0.3 | -0.7 |
| Jun-86 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | 0.3 | -0.5 |
| ***Jul-86*** | 1637 | 1535 | -9 | **1.4** | 2.7 | -0.4 | 0.3 | -0.5 |
| Aug-86 | 0 | 0 | -8 | -0.2 | -4.1 | -0.5 | 1.5 | 2.6 |
| Sep-86 | 0 | 0 | 7 | -0.1 | 0.0 | 0.3 | 1.7 | 3.0 |
| Oct-86 | 0 | 0 | -13 | -0.1 | -3.1 | -0.6 | 1.6 | 2.6 |
| Nov-86 | 0 | 0 | -9 | -0.1 | -2.6 | -0.5 | 0.5 | 2.4 |

Table 2B-15 Monthly Average Water Quality Change at
Banks Pumping Plant
Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | Δ Chloride [mg/l] | Δ DOC [mg/l] | Δ TTHM [ug/l] | Δ Bromate [ug/l] | Δ 3-Year Chloride [% Diff] | Δ 3-Year DOC [% Diff] |
|---|---|---|---|---|---|---|---|---|
| Dec-86 | 0 | 0 | -3 | -0.1 | -1.5 | -0.2 | 0.3 | 2.4 |
| Jan-87 | 0 | 0 | -1 | -0.2 | -2.5 | -0.2 | 0.7 | 2.6 |
| Feb-87 | 0 | 0 | -4 | -0.3 | -3.9 | -0.4 | 1.2 | 2.7 |
| Mar-87 | 0 | 0 | -5 | -0.4 | -4.7 | -0.4 | 0.4 | 2.2 |
| Apr-87 | 0 | 0 | -3 | -0.4 | -3.7 | -0.3 | 0.1 | 2.0 |
| **May-87** | 414 | 0 | -2 | -0.2 | 4.4 | 0.0 | 0.0 | 1.9 |
| **Jun-87** | 517 | 0 | 0 | 0.0 | 0.1 | 0.0 | 0.2 | 2.1 |
| **Jul-87** | 54 | 5 | 1 | -0.2 | -1.4 | 0.0 | 0.3 | 2.1 |
| Aug-87 | 0 | 0 | 4 | -0.2 | -1.2 | 0.1 | -0.1 | 0.3 |
| Sep-87 | 0 | 0 | 1 | -0.1 | -1.2 | 0.0 | 0.3 | 0.7 |
| Oct-87 | 0 | 0 | -3 | -0.1 | -2.5 | -0.2 | -0.1 | 0.8 |
| Nov-87 | 0 | 0 | -5 | -0.1 | -3.0 | -0.3 | -0.8 | 0.7 |
| Dec-87 | 0 | 0 | -1 | -0.1 | -1.6 | -0.1 | -0.3 | 0.6 |
| Jan-88 | 0 | 0 | 1 | -0.2 | -1.6 | -0.1 | 0.4 | 0.8 |
| **Feb-88** | 139 | 0 | 1 | -0.4 | -2.5 | -0.1 | 0.2 | 0.3 |
| Mar-88 | 0 | 0 | -2 | -0.5 | -4.9 | -0.3 | 0.5 | 0.6 |
| Apr-88 | 0 | 0 | -1 | -0.4 | -3.8 | -0.2 | 0.4 | 0.6 |
| May-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | 0.4 | 0.6 |
| Jun-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | 0.4 | 0.6 |
| Jul-88 | 0 | 0 | -1 | -0.5 | 1.3 | 0.0 | 0.4 | 0.7 |
| Aug-88 | 0 | 0 | 1 | -0.4 | 2.9 | 0.1 | 0.2 | 1.0 |
| Sep-88 | 0 | 0 | 3 | -0.2 | -2.4 | 0.0 | -0.1 | 1.2 |
| Oct-88 | 0 | 0 | 5 | -0.2 | -1.8 | 0.1 | 0.0 | 1.3 |
| Nov-88 | 0 | 0 | 6 | -0.2 | -1.1 | 0.1 | 0.3 | 1.4 |
| Dec-88 | 0 | 0 | 5 | -0.1 | -0.9 | 0.1 | 0.5 | 1.5 |
| Jan-89 | 0 | 0 | 3 | -0.3 | -2.1 | -0.1 | 0.6 | 1.6 |
| Feb-89 | 0 | 0 | 2 | -0.3 | -3.1 | -0.1 | 0.6 | 2.1 |
| Mar-89 | 0 | 0 | 0 | -0.3 | -2.4 | -0.1 | 0.3 | 1.7 |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.4 | -0.1 | 0.3 | 0.7 |
| May-89 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | 0.2 | 0.3 |
| **Jun-89** | 60 | 0 | -2 | -0.2 | -2.5 | -0.2 | 0.1 | -0.3 |
| **Jul-89** | 105 | 0 | 1 | -0.3 | -2.5 | -0.1 | 0.2 | -0.2 |
| Aug-89 | 0 | 0 | 3 | -0.2 | -1.6 | 0.1 | -1.0 | -5.2 |
| Sep-89 | 0 | 0 | 4 | -0.1 | -0.7 | 0.1 | -1.0 | -5.5 |
| Oct-89 | 0 | 0 | -2 | -0.1 | -2.4 | -0.2 | -1.1 | -5.2 |
| Nov-89 | 0 | 0 | -1 | -0.1 | -2.0 | -0.2 | -0.2 | -4.9 |
| Dec-89 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | 0.0 | -4.9 |
| Jan-90 | 0 | 0 | -4 | -0.2 | -3.2 | -0.3 | -0.6 | -5.4 |
| Feb-90 | 0 | 0 | -2 | -0.4 | -4.1 | -0.3 | -1.5 | -5.8 |
| Mar-90 | 0 | 0 | 0 | -0.3 | -2.6 | -0.1 | -0.9 | -5.5 |
| Apr-90 | 0 | 0 | -1 | -0.3 | -3.8 | -0.2 | -0.8 | -5.5 |
| May-90 | 0 | 0 | -1 | -0.4 | -3.7 | -0.2 | -0.8 | -5.6 |
| Jun-90 | 0 | 0 | -1 | -0.3 | 3.2 | 0.0 | -1.1 | -6.1 |
| Jul-90 | 0 | 0 | -2 | -0.6 | 0.6 | -0.1 | -1.4 | -6.7 |
| Aug-90 | 0 | 0 | 1 | -0.4 | 3.0 | 0.1 | -1.5 | -6.7 |
| Sep-90 | 0 | 0 | 1 | -0.2 | -2.3 | -0.1 | -1.4 | -6.5 |
| Oct-90 | 0 | 0 | -2 | -0.2 | -3.6 | -0.2 | -1.6 | -6.6 |
| Nov-90 | 0 | 0 | 1 | -0.2 | -2.4 | -0.1 | -1.1 | -6.5 |
| Dec-90 | 0 | 0 | 1 | -0.2 | -1.7 | -0.1 | -1.2 | -6.6 |
| Jan-91 | 0 | 0 | 0 | -0.4 | -3.8 | -0.3 | -1.4 | -6.8 |
| Feb-91 | 0 | 0 | -4 | -0.6 | -0.2 | -0.2 | -2.0 | -7.4 |
| Mar-91 | 0 | 0 | -2 | -0.4 | -4.5 | -0.3 | -1.8 | -7.5 |
| Apr-91 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | -2.0 | -7.6 |
| May-91 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | -2.0 | -7.6 |
| Jun-91 | 0 | 0 | -1 | -0.4 | 2.4 | 0.0 | -2.0 | -7.6 |
| Jul-91 | 0 | 0 | -1 | -0.6 | 1.1 | 0.0 | -2.0 | -7.6 |
| Aug-91 | 0 | 0 | 2 | -0.5 | 2.9 | 0.1 | -2.0 | -7.6 |
| Sep-91 | 0 | 0 | 4 | -0.2 | -1.7 | 0.1 | -2.1 | -7.7 |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-16 Monthly Average Water Quality Change at
Tracy Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | Δ Chloride [mg/l] | Δ DOC [mg/l] | Δ TTHM [ug/l] | Δ Bromate [ug/l] | Δ 3-Year Chloride [% Diff] | Δ 3-Year DOC [% Diff] |
|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 9 | -0.1 | 0.5 | 0.3 | n/a | n/a |
| **Nov-75** | 49 | 0 | -4 | -0.1 | -1.1 | -0.2 | n/a | n/a |
| Dec-75 | 0 | 0 | -6 | -0.1 | -1.9 | -0.3 | n/a | n/a |
| Jan-76 | 0 | 0 | -11 | -0.2 | -3.8 | -0.7 | n/a | n/a |
| Feb-76 | 0 | 0 | -13 | -0.3 | -6.4 | -0.8 | n/a | n/a |
| Mar-76 | 0 | 0 | -6 | -0.3 | -5.5 | -0.5 | n/a | n/a |
| Apr-76 | 0 | 0 | 6 | -0.3 | -2.9 | 0.1 | n/a | n/a |
| May-76 | 0 | 0 | 0 | -0.3 | -3.6 | -0.1 | n/a | n/a |
| Jun-76 | 0 | 0 | -1 | -0.3 | -3.9 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 1 | -0.3 | -3.4 | -0.1 | n/a | n/a |
| Aug-76 | 0 | 0 | 5 | -0.2 | -1.7 | 0.1 | n/a | n/a |
| Sep-76 | 0 | 0 | 1 | -0.1 | -1.3 | 0.0 | n/a | n/a |
| Oct-76 | 0 | 0 | 0 | -0.1 | -2.0 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 2 | -0.1 | -1.3 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 2 | -0.4 | -3.3 | -0.2 | n/a | n/a |
| Feb-77 | 0 | 0 | 0 | -0.4 | 2.9 | 0.1 | n/a | n/a |
| Mar-77 | 0 | 0 | 1 | -0.1 | -2.4 | -0.1 | n/a | n/a |
| Apr-77 | 0 | 0 | 1 | -0.4 | -4.7 | -0.2 | n/a | n/a |
| May-77 | 0 | 0 | 1 | -0.4 | -5.0 | -0.2 | n/a | n/a |
| Jun-77 | 0 | 0 | 0 | -0.4 | -6.2 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 2 | -0.4 | 2.8 | 0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 1 | -0.3 | -3.8 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 2 | -0.2 | -2.4 | 0.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 0 | -0.2 | -3.7 | -0.2 | n/a | n/a |
| Nov-77 | 0 | 0 | 1 | -0.2 | -2.2 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 4 | -0.2 | -2.0 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | 0 | -0.3 | -2.1 | -0.1 | n/a | n/a |
| Feb-78 | 0 | 0 | -1 | -0.3 | -1.7 | -0.2 | n/a | n/a |
| Mar-78 | 0 | 0 | 0 | -0.2 | -1.3 | -0.1 | n/a | n/a |
| Apr-78 | 0 | 0 | 0 | 0.0 | -0.3 | 0.0 | n/a | n/a |
| May-78 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | n/a | n/a |
| Jun-78 | 0 | 0 | -1 | -0.1 | -1.1 | -0.1 | n/a | n/a |
| **Jul-78** | 1844 | 1617 | 1 | **0.7** | 1.2 | 0.1 | n/a | n/a |
| Aug-78 | 0 | 0 | 4 | 0.0 | 1.2 | 0.2 | n/a | n/a |
| Sep-78 | 0 | 0 | **15** | 0.0 | 2.7 | 0.7 | n/a | n/a |
| **Oct-78** | 28 | 0 | 5 | -0.1 | 0.3 | 0.2 | -0.3 | -4.8 |
| Nov-78 | 0 | 0 | 1 | -0.1 | -0.8 | 0.0 | -0.4 | -4.7 |
| Dec-78 | 0 | 0 | 3 | -0.1 | -0.4 | 0.1 | -0.4 | -4.9 |
| Jan-79 | 0 | 0 | 3 | -0.2 | 3.8 | 0.3 | 0.8 | -4.5 |
| Feb-79 | 0 | 0 | 0 | -0.2 | -1.1 | -0.1 | 1.4 | -4.4 |
| Mar-79 | 0 | 0 | -1 | -0.1 | -0.8 | -0.1 | 2.0 | -4.3 |
| Apr-79 | 0 | 0 | 0 | -0.2 | -1.3 | 0.0 | 2.2 | -4.0 |
| May-79 | 0 | 0 | 0 | -0.1 | -1.3 | -0.1 | 2.3 | -4.1 |
| **Jun-79** | 350 | 0 | -1 | 0.0 | -0.2 | 0.0 | 2.3 | -4.0 |
| **Jul-79** | 1415 | 1558 | 0 | 0.6 | 5.3 | 0.2 | 2.3 | -3.7 |
| Aug-79 | 0 | 0 | 5 | 0.0 | 0.9 | 0.3 | 2.3 | -2.9 |
| Sep-79 | 0 | 0 | **16** | -0.1 | 1.9 | 0.7 | 2.4 | -2.7 |
| Oct-79 | 0 | 0 | **14** | -0.1 | 1.2 | 0.5 | 3.1 | -2.7 |
| Nov-79 | 0 | 0 | 3 | -0.1 | -0.5 | 0.1 | 3.2 | -2.9 |
| Dec-79 | 0 | 0 | 6 | -0.1 | -0.1 | 0.2 | 3.2 | -2.9 |
| Jan-80 | 0 | 0 | 1 | -0.1 | 0.0 | 0.1 | 3.4 | -2.9 |
| Feb-80 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.4 | -2.6 |
| Mar-80 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.6 | -2.3 |
| Apr-80 | 0 | 0 | 0 | -0.1 | -0.9 | -0.1 | 3.6 | -2.0 |
| May-80 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 3.6 | -1.9 |
| Jun-80 | 0 | 0 | -1 | -0.1 | -1.3 | -0.1 | 3.6 | -1.9 |
| **Jul-80** | 1844 | 1601 | -4 | **0.7** | -0.4 | -0.2 | 3.7 | -1.8 |
| Aug-80 | 0 | 0 | 2 | 0.0 | -0.1 | 0.1 | 3.6 | -1.1 |
| Sep-80 | 0 | 0 | **16** | -0.1 | 1.9 | 0.7 | 3.9 | -0.8 |
| **Oct-80** | 49 | 0 | 7 | -0.1 | 0.6 | 0.3 | 4.7 | -0.8 |
| Nov-80 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 5.0 | -0.7 |
| Dec-80 | 0 | 0 | -3 | -0.1 | -1.2 | -0.2 | 4.5 | -0.9 |
| Jan-81 | 0 | 0 | -3 | -0.1 | -1.8 | -0.2 | 4.3 | -0.8 |
| Feb-81 | 0 | 0 | -4 | -0.2 | -3.1 | -0.3 | 4.2 | -0.7 |
| Mar-81 | 0 | 0 | -1 | -0.3 | 2.9 | 0.0 | 4.1 | -0.6 |
| Apr-81 | 0 | 0 | -3 | -0.3 | -3.7 | -0.3 | 4.0 | -0.6 |

Table 2B-16 Monthly Average Water Quality Change at
Tracy Pumping Plant: Low-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| ***May-81*** | 19 | 0 | -1 | -0.2 | -2.3 | -0.1 | 3.8 | -0.8 |
| ***Jun-81*** | 439 | 0 | -1 | -0.1 | -1.1 | -0.1 | 3.7 | -0.9 |
| ***Jul-81*** | 664 | 263 | -1 | 0.1 | 0.8 | 0.0 | 3.7 | -0.9 |
| Aug-81 | 0 | 0 | 4 | -0.1 | -0.8 | 0.1 | 3.6 | -1.4 |
| Sep-81 | 0 | 0 | **11** | -0.1 | 0.8 | 0.4 | 3.5 | -1.5 |
| Oct-81 | 0 | 0 | 6 | -0.1 | -0.3 | 0.2 | 3.3 | -1.6 |
| Nov-81 | 0 | 0 | -5 | -0.1 | -2.2 | -0.3 | 3.3 | -1.6 |
| Dec-81 | 0 | 0 | -2 | -0.1 | -1.2 | -0.2 | 3.0 | -1.6 |
| Jan-82 | 0 | 0 | -1 | -0.3 | -1.3 | -0.1 | 2.0 | -2.0 |
| Feb-82 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | 1.9 | -2.0 |
| Mar-82 | 0 | 0 | 0 | 0.0 | 0.1 | 0.0 | 1.9 | -1.9 |
| Apr-82 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 2.0 | -1.8 |
| May-82 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 2.2 | -1.3 |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 2.3 | -1.2 |
| ***Jul-82*** | 1636 | 1613 | -6 | ***0.6*** | -1.2 | -0.4 | 2.3 | -1.3 |
| Aug-82 | 0 | 0 | 1 | -0.1 | -0.5 | 0.0 | 2.0 | -1.2 |
| Sep-82 | 0 | 0 | **19** | -0.1 | 2.3 | 0.8 | 1.8 | -1.3 |
| Oct-82 | 0 | 0 | 3 | 0.0 | 0.2 | 0.2 | 1.9 | -1.3 |
| Nov-82 | 0 | 0 | -1 | -0.1 | -0.8 | -0.1 | 2.1 | -1.0 |
| Dec-82 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.9 | -1.0 |
| Jan-83 | 0 | 0 | 1 | 0.0 | 0.2 | 0.1 | 1.7 | -0.9 |
| Feb-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.7 | -0.9 |
| Mar-83 | 0 | 0 | 1 | 0.0 | 0.1 | 0.1 | 1.7 | -0.9 |
| Apr-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.6 | -1.2 |
| May-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.7 | -1.2 |
| Jun-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 1.7 | -1.1 |
| Jul-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 1.8 | -1.0 |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 2.0 | -1.6 |
| Sep-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 1.6 | -1.9 |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.5 | 0.0 | 0.8 | -1.9 |
| Nov-83 | 0 | 0 | 0 | 0.0 | -0.2 | 0.0 | 0.3 | -1.9 |
| Dec-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.9 | -1.6 |
| Jan-84 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 1.2 | -1.6 |
| Feb-84 | 0 | 0 | 0 | -0.1 | -0.3 | 0.0 | 1.4 | -1.5 |
| Mar-84 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 1.7 | -1.4 |
| ***Apr-84*** | 188 | 0 | -1 | -0.1 | -0.9 | -0.1 | 1.8 | -1.3 |
| May-84 | 0 | 0 | -1 | -0.2 | -1.9 | -0.1 | 2.0 | -1.1 |
| ***Jun-84*** | 731 | 0 | -3 | 0.1 | 0.1 | -0.2 | 2.0 | -1.1 |
| ***Jul-84*** | 873 | 1535 | -5 | 0.4 | 2.8 | -0.2 | 1.9 | -0.9 |
| Aug-84 | 0 | 0 | -2 | -0.1 | -0.9 | -0.1 | 1.6 | -0.6 |
| Sep-84 | 0 | 0 | **13** | 0.0 | 1.8 | 0.6 | 1.1 | -0.5 |
| Oct-84 | 0 | 0 | 9 | -0.1 | 0.6 | 0.3 | 1.2 | -0.5 |
| Nov-84 | 0 | 0 | -12 | -0.1 | -3.9 | -0.6 | 1.5 | -0.5 |
| Dec-84 | 0 | 0 | -7 | -0.1 | -2.5 | -0.5 | 0.9 | -0.5 |
| ***Jan-85*** | 399 | 0 | 0 | -0.2 | 3.1 | 0.2 | 0.5 | -0.5 |
| ***Feb-85*** | 61 | 0 | 0 | -0.2 | 3.6 | 0.2 | 0.6 | -0.5 |
| Mar-85 | 0 | 0 | 0 | -0.3 | 2.8 | 0.1 | 0.5 | -0.7 |
| Apr-85 | 0 | 0 | -2 | -0.3 | 3.3 | 0.0 | 0.5 | -0.9 |
| May-85 | 0 | 0 | -1 | -0.2 | -2.9 | -0.2 | 0.4 | -1.1 |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.4 | -0.1 | 0.4 | -1.2 |
| ***Jul-85*** | 38 | 0 | 3 | -0.2 | -1.4 | 0.1 | 0.3 | -1.3 |
| Aug-85 | 0 | 0 | 6 | -0.1 | -0.5 | 0.2 | 0.9 | -2.1 |
| Sep-85 | 0 | 0 | 3 | -0.1 | -0.7 | 0.1 | 1.3 | -2.2 |
| Oct-85 | 0 | 0 | 0 | -0.1 | -1.6 | -0.1 | 0.2 | -2.2 |
| Nov-85 | 0 | 0 | -2 | -0.1 | -1.8 | -0.2 | 0.0 | -2.2 |
| Dec-85 | 0 | 0 | 0 | -0.2 | -1.3 | -0.1 | 0.0 | -2.3 |
| Jan-86 | 0 | 0 | 0 | -0.2 | -1.4 | -0.1 | 0.0 | -2.4 |
| Feb-86 | 0 | 0 | 0 | -0.1 | -0.5 | 0.0 | 0.0 | -2.6 |
| Mar-86 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -2.5 |
| Apr-86 | 0 | 0 | 0 | -0.1 | 3.9 | 0.0 | 0.0 | -2.5 |
| ***May-86*** | 290 | 0 | 0 | 0.1 | 1.0 | 0.0 | 0.0 | -2.5 |
| Jun-86 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | 0.0 | -2.5 |
| ***Jul-86*** | 1637 | 1535 | -8 | ***1.4*** | 2.7 | -0.4 | -0.1 | -2.6 |
| Aug-86 | 0 | 0 | -7 | -0.2 | -3.8 | -0.5 | -0.1 | -2.4 |
| Sep-86 | 0 | 0 | 7 | -0.1 | 0.0 | 0.3 | 0.4 | -1.6 |
| Oct-86 | 0 | 0 | -13 | 0.0 | -3.0 | -0.6 | 0.7 | -1.6 |
| Nov-86 | 0 | 0 | -9 | -0.1 | -2.6 | -0.5 | 0.1 | -1.6 |

Table 2B-16 Monthly Average Water Quality Change at
Tracy Pumping Plant: Low-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | Δ Chloride [mg/l] | Δ DOC [mg/l] | Δ TTHM [ug/l] | Δ Bromate [ug/l] | Δ 3-Year Chloride [% Diff] | Δ 3-Year DOC [% Diff] |
|---|---|---|---|---|---|---|---|---|
| Dec-86 | 0 | 0 | -3 | -0.1 | -1.4 | -0.2 | -0.3 | -1.7 |
| Jan-87 | 0 | 0 | 0 | -0.2 | -2.1 | -0.2 | -1.0 | -2.0 |
| Feb-87 | 0 | 0 | -3 | -0.2 | -3.6 | -0.3 | -1.8 | -2.5 |
| Mar-87 | 0 | 0 | -5 | -0.4 | -4.5 | -0.4 | -1.8 | -2.6 |
| Apr-87 | 0 | 0 | -3 | -0.3 | -3.6 | -0.3 | -1.9 | -2.7 |
| ***May-87*** | 414 | 0 | -2 | -0.2 | 4.4 | 0.0 | -1.9 | -2.8 |
| ***Jun-87*** | 517 | 0 | 0 | 0.0 | 0.1 | 0.0 | -1.9 | -2.8 |
| ***Jul-87*** | 54 | 5 | 1 | -0.2 | -1.4 | 0.0 | -1.8 | -2.9 |
| Aug-87 | 0 | 0 | 4 | -0.2 | -1.2 | 0.1 | -1.5 | -3.5 |
| Sep-87 | 0 | 0 | 1 | -0.1 | -1.3 | 0.0 | -1.3 | -3.6 |
| Oct-87 | 0 | 0 | -2 | -0.1 | -2.4 | -0.2 | -1.8 | -3.6 |
| Nov-87 | 0 | 0 | -5 | -0.1 | -3.0 | -0.4 | -2.2 | -3.6 |
| Dec-87 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | -1.9 | -3.6 |
| Jan-88 | 0 | 0 | 1 | -0.2 | -1.4 | -0.1 | -1.5 | -3.6 |
| ***Feb-88*** | 139 | 0 | 1 | -0.4 | -2.4 | -0.1 | -1.5 | -3.6 |
| Mar-88 | 0 | 0 | -2 | -0.5 | -4.7 | -0.3 | -1.5 | -3.7 |
| Apr-88 | 0 | 0 | -1 | -0.4 | -3.7 | -0.2 | -1.4 | -3.5 |
| May-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | -1.4 | -3.5 |
| Jun-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | -1.4 | -3.5 |
| Jul-88 | 0 | 0 | -1 | -0.5 | 1.4 | 0.0 | -1.4 | -3.5 |
| Aug-88 | 0 | 0 | 1 | -0.4 | 2.9 | 0.1 | -1.6 | -3.5 |
| Sep-88 | 0 | 0 | 3 | -0.2 | -2.4 | 0.0 | -1.9 | -3.6 |
| Oct-88 | 0 | 0 | 5 | -0.2 | -1.8 | 0.1 | -1.9 | -3.7 |
| Nov-88 | 0 | 0 | 6 | -0.2 | -1.1 | 0.1 | -1.8 | -3.7 |
| Dec-88 | 0 | 0 | 4 | -0.1 | -0.8 | 0.1 | -1.6 | -3.7 |
| Jan-89 | 0 | 0 | 3 | -0.2 | -1.9 | 0.0 | -1.4 | -3.8 |
| Feb-89 | 0 | 0 | 1 | -0.2 | -2.1 | -0.1 | -1.3 | -3.8 |
| Mar-89 | 0 | 0 | 0 | -0.3 | -2.2 | -0.1 | -1.3 | -4.1 |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.4 | -0.1 | -1.2 | -4.4 |
| May-89 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | -1.2 | -4.4 |
| ***Jun-89*** | 60 | 0 | -2 | -0.2 | -2.4 | -0.2 | -1.2 | -4.6 |
| ***Jul-89*** | 105 | 0 | 1 | -0.3 | -2.4 | -0.1 | -1.3 | -4.6 |
| Aug-89 | 0 | 0 | 4 | -0.2 | -1.6 | 0.1 | -1.1 | -4.8 |
| Sep-89 | 0 | 0 | 4 | -0.1 | -0.7 | 0.1 | -1.4 | -5.8 |
| Oct-89 | 0 | 0 | -2 | -0.1 | -2.3 | -0.2 | -1.5 | -5.8 |
| Nov-89 | 0 | 0 | -1 | -0.1 | -2.0 | -0.2 | -1.1 | -5.8 |
| Dec-89 | 0 | 0 | 0 | -0.1 | -1.6 | -0.1 | -0.7 | -5.9 |
| Jan-90 | 0 | 0 | -3 | -0.2 | -2.7 | -0.3 | 0.0 | -5.5 |
| Feb-90 | 0 | 0 | -2 | -0.4 | -3.8 | -0.3 | 0.6 | -5.0 |
| Mar-90 | 0 | 0 | 0 | -0.3 | -2.6 | -0.1 | 0.6 | -5.1 |
| Apr-90 | 0 | 0 | -1 | -0.3 | -3.8 | -0.2 | 0.7 | -5.1 |
| May-90 | 0 | 0 | -1 | -0.4 | -3.8 | -0.2 | 0.8 | -5.0 |
| Jun-90 | 0 | 0 | -1 | -0.3 | 3.3 | 0.0 | 0.8 | -5.2 |
| Jul-90 | 0 | 0 | -2 | -0.5 | 0.6 | -0.1 | 0.9 | -5.2 |
| Aug-90 | 0 | 0 | 1 | -0.4 | 3.0 | 0.1 | 0.8 | -5.2 |
| Sep-90 | 0 | 0 | 1 | -0.2 | -2.5 | -0.1 | 0.6 | -5.4 |
| Oct-90 | 0 | 0 | -2 | -0.2 | -3.6 | -0.2 | 0.6 | -5.4 |
| Nov-90 | 0 | 0 | 1 | -0.2 | -2.4 | -0.1 | 0.7 | -5.4 |
| Dec-90 | 0 | 0 | 1 | -0.2 | -1.6 | -0.1 | 0.9 | -5.4 |
| Jan-91 | 0 | 0 | 0 | -0.3 | -3.3 | -0.3 | 0.9 | -5.5 |
| Feb-91 | 0 | 0 | -3 | -0.5 | -7.3 | -0.5 | 0.8 | -5.7 |
| Mar-91 | 0 | 0 | -2 | -0.4 | -4.0 | -0.3 | 0.9 | -5.7 |
| Apr-91 | 0 | 0 | 0 | -0.2 | -1.5 | -0.1 | 0.7 | -5.9 |
| May-91 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | 0.7 | -5.8 |
| Jun-91 | 0 | 0 | -1 | -0.2 | 4.9 | 0.1 | 0.7 | -5.8 |
| Jul-91 | 0 | 0 | -1 | -0.5 | 1.2 | 0.0 | 0.8 | -5.7 |
| Aug-91 | 0 | 0 | 1 | -0.5 | 2.9 | 0.1 | 0.8 | -5.6 |
| Sep-91 | 0 | 0 | 4 | -0.2 | -1.7 | 0.1 | 0.8 | -5.6 |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-17 Monthly Average Water Quality Change at
Rock Slough: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Oct-75 | 0 | 0 | **13** | -0.1 | 0.5 | 0.4 | n/a | n/a |
| **Nov-75** | 49 | 0 | -9 | -0.1 | -2.4 | -0.5 | n/a | n/a |
| Dec-75 | 0 | 0 | -12 | -0.1 | -3.7 | -0.6 | n/a | n/a |
| Jan-76 | 0 | 0 | -26 | -0.2 | -7.9 | -1.3 | n/a | n/a |
| Feb-76 | 0 | 0 | -23 | -0.4 | -9.9 | -1.3 | n/a | n/a |
| Mar-76 | 0 | 0 | -5 | -0.5 | -5.9 | -0.5 | n/a | n/a |
| Apr-76 | 0 | 0 | 2 | -0.4 | -4.2 | -0.1 | n/a | n/a |
| May-76 | 0 | 0 | -1 | -0.3 | -4.1 | -0.2 | n/a | n/a |
| Jun-76 | 0 | 0 | 0 | -0.3 | -3.9 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 4 | -0.3 | -3.1 | 0.0 | n/a | n/a |
| Aug-76 | 0 | 0 | 9 | -0.2 | -1.5 | 0.2 | n/a | n/a |
| Sep-76 | 0 | 0 | -2 | -0.1 | -2.6 | -0.2 | n/a | n/a |
| Oct-76 | 0 | 0 | 2 | -0.2 | -3.1 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 4 | -0.2 | -2.1 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 3 | -0.3 | -2.9 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 3 | -0.5 | -6.1 | -0.4 | n/a | n/a |
| Feb-77 | 0 | 0 | -1 | -0.6 | -9.0 | -0.6 | n/a | n/a |
| Mar-77 | 0 | 0 | 4 | -0.9 | -2.9 | -0.1 | n/a | n/a |
| Apr-77 | 0 | 0 | 2 | -0.5 | -5.6 | -0.2 | n/a | n/a |
| May-77 | 0 | 0 | -1 | -0.4 | -5.4 | -0.3 | n/a | n/a |
| Jun-77 | 0 | 0 | 1 | -0.4 | -6.7 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 3 | -0.4 | -5.1 | -0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 3 | -0.3 | -3.9 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 4 | -0.2 | -3.3 | -0.1 | n/a | n/a |
| Oct-77 | 0 | 0 | -1 | -0.2 | -6.1 | -0.4 | n/a | n/a |
| Nov-77 | 0 | 0 | 4 | -0.2 | -2.6 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 9 | -0.3 | -3.2 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | -3 | -0.8 | -5.8 | -0.5 | n/a | n/a |
| Feb-78 | 0 | 0 | -6 | -1.2 | -8.1 | -0.7 | n/a | n/a |
| Mar-78 | 0 | 0 | -3 | -0.8 | -5.5 | -0.4 | n/a | n/a |
| Apr-78 | 0 | 0 | -1 | -0.2 | -2.1 | -0.1 | n/a | n/a |
| May-78 | 0 | 0 | -1 | -0.1 | -1.3 | -0.1 | n/a | n/a |
| Jun-78 | 0 | 0 | -2 | -0.1 | -1.7 | -0.1 | n/a | n/a |
| **Jul-78** | 1644 | 1617 | 0 | **2.7** | 16.8 | 0.5 | n/a | n/a |
| Aug-78 | 0 | 0 | 6 | 0.2 | 3.7 | 0.4 | n/a | n/a |
| Sep-78 | 0 | 0 | **26** | 0.0 | 4.2 | 1.0 | n/a | n/a |
| **Oct-78** | 28 | 0 | 6 | -0.1 | -0.6 | 0.1 | 1.6 | -2.4 |
| Nov-78 | 0 | 0 | 1 | -0.1 | -1.3 | -0.1 | 1.5 | -2.4 |
| Dec-78 | 0 | 0 | 8 | -0.1 | -1.0 | 0.1 | 1.8 | -2.4 |
| Jan-79 | 0 | 0 | 5 | -0.5 | -4.2 | -0.1 | 2.1 | -2.4 |
| Feb-79 | 0 | 0 | -6 | -1.1 | -8.1 | -0.7 | 2.5 | -2.6 |
| Mar-79 | 0 | 0 | -3 | -0.7 | -4.8 | -0.3 | 2.8 | -2.8 |
| Apr-79 | 0 | 0 | -1 | -0.2 | -2.4 | -0.1 | 2.8 | -3.0 |
| May-79 | 0 | 0 | -1 | -0.2 | -1.8 | -0.1 | 2.8 | -3.0 |
| **Jun-79** | 350 | 0 | -2 | -0.2 | -2.1 | -0.2 | 2.9 | -2.9 |
| **Jul-79** | 1415 | 1558 | 0 | **2.3** | 15.6 | 0.5 | 2.7 | -2.9 |
| Aug-79 | 0 | 0 | 9 | 0.1 | 3.4 | 0.5 | 2.7 | 0.4 |
| Sep-79 | 0 | 0 | **29** | -0.1 | 3.8 | 1.1 | 2.8 | 0.7 |
| Oct-79 | 0 | 0 | **22** | -0.1 | 1.6 | **0.6** | 3.8 | 0.8 |
| Nov-79 | 0 | 0 | 5 | -0.1 | -0.7 | 0.1 | 4.3 | 0.8 |
| Dec-79 | 0 | 0 | **14** | -0.2 | 0.1 | 0.4 | 4.3 | 0.8 |
| Jan-80 | 0 | 0 | -1 | -0.7 | -4.5 | -0.3 | 4.5 | 0.7 |
| Feb-80 | 0 | 0 | -13 | -1.1 | -8.8 | -1.1 | 4.5 | 0.6 |
| Mar-80 | 0 | 0 | 2 | -0.4 | 2.1 | 0.2 | 4.6 | 0.7 |
| Apr-80 | 0 | 0 | -1 | -0.3 | -2.9 | -0.2 | 4.7 | 1.2 |
| May-80 | 0 | 0 | -1 | -0.1 | -1.6 | -0.1 | 4.7 | 1.6 |
| Jun-80 | 0 | 0 | -2 | -0.2 | -1.9 | -0.2 | 4.8 | 1.9 |
| **Jul-80** | 1644 | 1601 | -1 | **2.9** | 17.5 | 0.5 | 4.7 | 2.0 |
| Aug-80 | 0 | 0 | 5 | 0.3 | 4.2 | 0.4 | 4.7 | **6.1** |
| Sep-80 | 0 | 0 | **21** | 0.0 | 4.5 | 1.3 | 4.9 | **6.8** |
| **Oct-80** | 49 | 0 | 8 | -0.1 | -0.1 | 0.2 | **6.0** | **7.0** |
| Nov-80 | 0 | 0 | -2 | -0.1 | -1.7 | -0.2 | **6.6** | **7.2** |
| Dec-80 | 0 | 0 | -9 | -0.1 | -3.0 | -0.5 | **6.5** | **7.3** |
| Jan-81 | 0 | 0 | -8 | -0.2 | -4.4 | -0.5 | **6.3** | **7.5** |
| Feb-81 | 0 | 0 | -6 | -0.4 | -4.5 | -0.5 | **6.1** | **8.0** |
| Mar-81 | 0 | 0 | -1 | -0.4 | -3.2 | -0.2 | **6.2** | **8.9** |
| Apr-81 | 0 | 0 | -2 | -0.3 | -2.9 | -0.2 | **6.2** | **9.2** |

Table 2B-17 Monthly Average Water Quality Change at
Rock Slough: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | Δ Chloride [mg/l] | Δ DOC [mg/l] | Δ TTHM [ug/l] | Δ Bromate [ug/l] | Δ 3-Year Chloride [% Diff] | Δ 3-Year DOC [% Diff] |
|---|---|---|---|---|---|---|---|---|
| ***May-81*** | 19 | 0 | -1 | -0.2 | -2.8 | -0.2 | ***6.3*** | ***9.5*** |
| ***Jun-81*** | 439 | 0 | -1 | -0.2 | -2.7 | -0.2 | ***6.3*** | ***9.4*** |
| ***Jul-81*** | 664 | 263 | -2 | 0.2 | 2.2 | 0.0 | ***6.1*** | ***9.1*** |
| Aug-81 | 0 | 0 | 9 | -0.1 | -0.3 | 0.3 | ***6.0*** | 3.6 |
| Sep-81 | 0 | 0 | ***19*** | -0.1 | 1.5 | 0.6 | ***6.0*** | 2.9 |
| Oct-81 | 0 | 0 | 5 | -0.1 | -1.6 | 0.0 | ***5.1*** | 2.8 |
| Nov-81 | 0 | 0 | -9 | -0.1 | -3.4 | -0.4 | ***5.0*** | 2.9 |
| Dec-81 | 0 | 0 | -4 | -0.2 | -1.8 | -0.3 | 4.7 | 2.9 |
| Jan-82 | 0 | 0 | -7 | -0.9 | -5.7 | -0.7 | 4.5 | 2.9 |
| Feb-82 | 0 | 0 | 0 | -0.6 | -3.2 | -0.1 | 4.4 | 2.6 |
| Mar-82 | 0 | 0 | -1 | -1.4 | -8.6 | -0.4 | 4.5 | 2.9 |
| Apr-82 | 0 | 0 | -1 | -0.5 | -3.6 | -0.1 | 4.6 | 3.4 |
| May-82 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | 4.6 | 3.4 |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.5 | -0.1 | 4.7 | 3.4 |
| ***Jul-82*** | 1636 | 1613 | -1 | ***2.9*** | 18.1 | 0.5 | 4.7 | 3.5 |
| Aug-82 | 0 | 0 | 9 | 0.4 | 6.3 | 0.7 | 4.6 | 4.4 |
| Sep-82 | 0 | 0 | ***22*** | 0.0 | 4.9 | 1.4 | 4.7 | 4.8 |
| Oct-82 | 0 | 0 | 5 | 0.0 | 0.3 | 0.3 | 4.9 | 4.9 |
| Nov-82 | 0 | 0 | -3 | -0.1 | -1.2 | -0.2 | 4.5 | 5.0 |
| Dec-82 | 0 | 0 | 0 | -0.9 | -1.1 | -0.1 | 4.4 | 4.9 |
| Jan-83 | 0 | 0 | -1 | -0.6 | -3.5 | -0.3 | 4.1 | 4.4 |
| Feb-83 | 0 | 0 | 0 | -0.1 | -0.3 | 0.0 | 4.1 | 4.4 |
| Mar-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 4.3 | 4.7 |
| Apr-83 | 0 | 0 | -1 | -0.4 | -2.4 | -0.2 | 4.3 | 4.8 |
| May-83 | 0 | 0 | -2 | -0.4 | -3.1 | -0.2 | 4.3 | 4.8 |
| Jun-83 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 4.3 | 4.5 |
| Jul-83 | 0 | 0 | -1 | -0.1 | -1.2 | -0.1 | 4.4 | 4.6 |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.4 | -0.1 | 4.4 | 0.4 |
| Sep-83 | 0 | 0 | 1 | -0.1 | -0.9 | 0.0 | 4.1 | -0.3 |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 2.6 | -0.3 |
| Nov-83 | 0 | 0 | 0 | -0.1 | -0.5 | 0.0 | 2.3 | -0.3 |
| Dec-83 | 0 | 0 | 0 | -0.1 | 2.6 | 0.1 | 2.5 | -0.3 |
| Jan-84 | 0 | 0 | 3 | -0.5 | -1.6 | 0.2 | 2.9 | -0.3 |
| Feb-84 | 0 | 0 | 1 | -0.3 | -2.2 | 0.0 | 3.3 | -0.4 |
| Mar-84 | 0 | 0 | 0 | -0.3 | -2.4 | -0.1 | 3.5 | -0.4 |
| ***Apr-84*** | 188 | 0 | -1 | -0.2 | -2.0 | -0.1 | 3.6 | -0.4 |
| May-84 | 0 | 0 | -1 | -0.2 | -2.5 | -0.2 | 3.6 | -0.4 |
| ***Jun-84*** | 731 | 0 | -1 | -0.1 | -1.7 | -0.1 | 3.6 | -0.3 |
| ***Jul-84*** | 873 | 1535 | -4 | ***2.6*** | 16.4 | 0.3 | 3.7 | -0.2 |
| Aug-84 | 0 | 0 | -2 | 0.1 | 0.7 | -0.1 | 3.6 | 3.1 |
| Sep-84 | 0 | 0 | ***24*** | -0.1 | 3.1 | 1.0 | 2.8 | 3.4 |
| Oct-84 | 0 | 0 | 10 | -0.1 | -0.1 | 0.3 | 3.3 | 3.5 |
| Nov-84 | 0 | 0 | -20 | -0.1 | -5.9 | -0.9 | 3.7 | 3.5 |
| Dec-84 | 0 | 0 | -11 | -0.2 | -3.4 | -0.7 | 3.2 | 3.5 |
| ***Jan-85*** | 399 | 0 | 2 | -0.3 | -2.0 | 0.0 | 2.8 | 2.5 |
| ***Feb-85*** | 61 | 0 | 0 | -0.4 | -3.5 | -0.2 | 3.1 | 3.9 |
| Mar-85 | 0 | 0 | -2 | -0.5 | -4.5 | -0.3 | 3.1 | 4.0 |
| Apr-85 | 0 | 0 | -2 | -0.4 | -4.6 | -0.3 | 3.0 | 4.0 |
| May-85 | 0 | 0 | -2 | -0.3 | -3.3 | -0.2 | 3.0 | 4.0 |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.5 | -0.1 | 2.9 | 3.9 |
| ***Jul-85*** | 38 | 0 | 5 | -0.2 | -1.4 | 0.1 | 2.9 | 3.8 |
| Aug-85 | 0 | 0 | 10 | -0.1 | -0.4 | 0.3 | 3.4 | -0.7 |
| Sep-85 | 0 | 0 | 2 | -0.1 | -1.4 | 0.0 | 3.2 | -1.6 |
| Oct-85 | 0 | 0 | -1 | -0.1 | -2.7 | -0.2 | 1.3 | -1.7 |
| Nov-85 | 0 | 0 | -5 | -0.1 | -2.8 | -0.3 | 1.0 | -1.7 |
| Dec-85 | 0 | 0 | 0 | -0.2 | -2.7 | -0.2 | 0.9 | -1.8 |
| Jan-86 | 0 | 0 | 0 | -0.3 | -2.6 | -0.2 | 0.8 | -1.3 |
| Feb-86 | 0 | 0 | -2 | -0.7 | -4.3 | -0.3 | 0.9 | -1.2 |
| Mar-86 | 0 | 0 | 1 | -0.3 | -1.1 | 0.1 | 0.8 | -1.3 |
| Apr-86 | 0 | 0 | -1 | -0.3 | -2.0 | -0.1 | 0.9 | -1.5 |
| ***May-86*** | 290 | 0 | -1 | -0.1 | -1.0 | -0.1 | 0.9 | -1.5 |
| Jun-86 | 0 | 0 | -2 | -0.2 | -2.3 | -0.2 | 0.9 | -1.2 |
| ***Jul-86*** | 1637 | 1535 | -4 | ***2.9*** | 16.6 | 0.2 | 0.8 | -1.4 |
| Aug-86 | 0 | 0 | -2 | 0.2 | 1.2 | -0.1 | 0.6 | 3.2 |
| Sep-86 | 0 | 0 | ***16*** | -0.1 | 1.8 | 0.7 | 0.5 | 3.6 |
| Oct-86 | 0 | 0 | -30 | -0.1 | -6.2 | -1.3 | 1.2 | 3.6 |
| Nov-86 | 0 | 0 | -14 | -0.1 | -3.7 | -0.7 | 0.0 | 3.7 |

2B-50

Table 2B-17 Monthly Average Water Quality Change at
Rock Slough : High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Dec-86 | 0 | 0 | -6 | -0.2 | -3.7 | -0.4 | -0.5 | 3.6 |
| Jan-87 | 0 | 0 | -2 | -0.3 | -4.7 | -0.4 | -0.6 | 3.7 |
| Feb-87 | 0 | 0 | -13 | -0.4 | -8.7 | -0.9 | -0.7 | 3.8 |
| Mar-87 | 0 | 0 | -6 | -0.5 | -5.0 | -0.5 | -0.9 | 3.8 |
| Apr-87 | 0 | 0 | -2 | -0.4 | -3.1 | -0.2 | -1.0 | 3.6 |
| ***May-87*** | 414 | 0 | -1 | -0.3 | -3.4 | -0.2 | -1.0 | 3.6 |
| ***Jun-87*** | 517 | 0 | -1 | -0.2 | -2.3 | -0.1 | -1.0 | 3.5 |
| ***Jul-87*** | 54 | 5 | 3 | -0.2 | -1.5 | 0.1 | -1.0 | 3.4 |
| Aug-87 | 0 | 0 | 6 | -0.2 | -1.2 | 0.2 | -0.6 | -0.9 |
| Sep-87 | 0 | 0 | -1 | -0.1 | -2.7 | -0.2 | -0.2 | -1.3 |
| Oct-87 | 0 | 0 | -8 | -0.1 | -4.6 | -0.5 | -1.3 | -1.4 |
| Nov-87 | 0 | 0 | -9 | -0.2 | -4.1 | -0.5 | -1.8 | -1.4 |
| Dec-87 | 0 | 0 | 0 | -0.1 | -2.3 | -0.2 | -1.3 | -1.3 |
| Jan-88 | 0 | 0 | 1 | -0.3 | -2.1 | -0.1 | -1.1 | -1.3 |
| ***Feb-88*** | 139 | 0 | 1 | -0.4 | -2.2 | 0.0 | -1.1 | -1.3 |
| Mar-88 | 0 | 0 | 2 | -0.6 | -4.7 | -0.1 | -1.1 | -1.2 |
| Apr-88 | 0 | 0 | -1 | -0.5 | -5.1 | -0.3 | -1.0 | -1.3 |
| May-88 | 0 | 0 | -2 | -0.4 | -4.5 | -0.3 | -1.0 | -1.3 |
| Jun-88 | 0 | 0 | -2 | -0.4 | -4.8 | -0.3 | -1.0 | -1.4 |
| Jul-88 | 0 | 0 | -1 | -0.4 | -5.4 | -0.3 | -1.0 | -1.5 |
| Aug-88 | 0 | 0 | 4 | -0.4 | -4.5 | -0.1 | -1.3 | -1.5 |
| Sep-88 | 0 | 0 | 7 | -0.2 | -2.6 | 0.1 | -1.7 | -1.7 |
| Oct-88 | 0 | 0 | 10 | -0.2 | -2.3 | 0.1 | -1.8 | -1.7 |
| Nov-88 | 0 | 0 | **10** | -0.2 | -1.3 | 0.2 | -1.4 | -1.8 |
| Dec-88 | 0 | 0 | 8 | -0.2 | -1.7 | 0.1 | -0.9 | -1.9 |
| Jan-89 | 0 | 0 | 3 | -0.3 | -3.6 | -0.2 | -0.8 | -1.8 |
| Feb-89 | 0 | 0 | 3 | -0.6 | -6.9 | -0.4 | -0.7 | -1.9 |
| Mar-89 | 0 | 0 | 0 | -0.3 | -2.4 | -0.1 | -0.6 | -2.0 |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.7 | -0.1 | -0.6 | -2.0 |
| May-89 | 0 | 0 | -2 | -0.3 | -2.4 | -0.2 | -0.7 | -2.1 |
| ***Jun-89*** | 60 | 0 | -1 | -0.2 | -2.6 | -0.2 | -0.7 | -2.2 |
| ***Jul-89*** | 105 | 0 | 3 | -0.3 | -2.4 | 0.0 | -0.7 | -2.4 |
| Aug-89 | 0 | 0 | 6 | -0.2 | -1.4 | 0.2 | -0.2 | -7.6 |
| Sep-89 | 0 | 0 | 5 | -0.1 | -1.0 | 0.1 | 0.4 | -8.2 |
| Oct-89 | 0 | 0 | -6 | -0.1 | -3.8 | -0.4 | 0.0 | -8.3 |
| Nov-89 | 0 | 0 | -2 | -0.1 | -2.6 | -0.2 | 0.6 | -8.3 |
| Dec-89 | 0 | 0 | -1 | -0.2 | -3.2 | -0.3 | 1.1 | -8.4 |
| Jan-90 | 0 | 0 | -6 | -0.3 | -5.0 | -0.5 | 1.2 | -8.4 |
| Feb-90 | 0 | 0 | -2 | -0.4 | -4.5 | -0.4 | 1.1 | -8.3 |
| Mar-90 | 0 | 0 | -1 | -0.4 | -3.7 | -0.2 | 1.3 | -8.3 |
| Apr-90 | 0 | 0 | -2 | -0.7 | -1.0 | -0.2 | 1.3 | -8.3 |
| May-90 | 0 | 0 | -2 | -0.3 | 3.0 | 0.0 | 1.3 | -8.3 |
| Jun-90 | 0 | 0 | -5 | -0.4 | -5.6 | -0.4 | 1.3 | -8.3 |
| Jul-90 | 0 | 0 | 0 | -0.5 | -6.3 | -0.3 | 1.2 | -8.4 |
| Aug-90 | 0 | 0 | 5 | -0.4 | -4.9 | -0.1 | 1.1 | -8.7 |
| Sep-90 | 0 | 0 | -3 | -0.2 | -4.5 | -0.3 | 0.9 | -8.9 |
| Oct-90 | 0 | 0 | -2 | -0.2 | -5.7 | -0.4 | 0.9 | -9.0 |
| Nov-90 | 0 | 0 | 3 | -0.2 | -2.6 | -0.1 | 1.0 | -9.0 |
| Dec-90 | 0 | 0 | 3 | -0.3 | -2.8 | -0.1 | 1.1 | -9.0 |
| Jan-91 | 0 | 0 | -4 | -0.5 | -8.6 | -0.7 | 1.2 | -9.0 |
| Feb-91 | 0 | 0 | -10 | -0.9 | -16.8 | -1.3 | 1.1 | -9.3 |
| Mar-91 | 0 | 0 | -3 | -0.5 | -4.6 | -0.4 | 0.8 | -9.7 |
| Apr-91 | 0 | 0 | -1 | -0.3 | -2.2 | -0.2 | 0.7 | -9.6 |
| May-91 | 0 | 0 | -1 | -0.3 | 3.1 | 0.0 | 0.7 | -9.4 |
| Jun-91 | 0 | 0 | -2 | -0.4 | -5.4 | -0.3 | 0.7 | -9.3 |
| Jul-91 | 0 | 0 | 0 | -0.4 | -5.5 | -0.2 | 0.7 | -9.3 |
| Aug-91 | 0 | 0 | 6 | -0.4 | -4.9 | 0.0 | 0.7 | -9.4 |
| Sep-91 | 0 | 0 | 8 | -0.2 | -1.8 | 0.1 | 0.8 | -9.5 |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-18 Monthly Average Water Quality Change at
Los Vaqueros Reservoir Intake: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Oct-75 | 0 | 0 | **12** | -0.1 | 0.1 | 0.4 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | -6 | 0.0 | -1.6 | -0.2 | n/a | n/a |
| Dec-75 | 0 | 0 | -10 | -0.1 | -2.7 | -0.5 | n/a | n/a |
| Jan-76 | 0 | 0 | -21 | -0.3 | -6.9 | -1.1 | n/a | n/a |
| Feb-76 | 0 | 0 | -21 | -0.4 | -10.3 | -1.3 | n/a | n/a |
| Mar-76 | 0 | 0 | -9 | -0.5 | -7.9 | -0.7 | n/a | n/a |
| Apr-76 | 0 | 0 | 2 | -0.4 | -5.2 | 0.0 | n/a | n/a |
| May-76 | 0 | 0 | 0 | -0.3 | -4.4 | -0.2 | n/a | n/a |
| Jun-76 | 0 | 0 | -1 | -0.3 | -4.0 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 2 | -0.3 | -3.5 | 0.0 | n/a | n/a |
| Aug-76 | 0 | 0 | 7 | -0.2 | -2.0 | 0.2 | n/a | n/a |
| Sep-76 | 0 | 0 | 0 | -0.1 | -0.7 | -0.1 | n/a | n/a |
| Oct-76 | 0 | 0 | 1 | -0.2 | -0.9 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 3 | -0.2 | -1.7 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 2 | -0.3 | -3.4 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 3 | -0.5 | -5.9 | -0.3 | n/a | n/a |
| Feb-77 | 0 | 0 | 0 | -0.6 | 0.0 | -0.1 | n/a | n/a |
| Mar-77 | 0 | 0 | 2 | -0.7 | *-11.2* | -0.4 | n/a | n/a |
| Apr-77 | 0 | 0 | 3 | -0.6 | -0.3 | 0.1 | n/a | n/a |
| May-77 | 0 | 0 | 0 | -0.4 | -6.4 | -0.2 | n/a | n/a |
| Jun-77 | 0 | 0 | 0 | -0.5 | -6.5 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 2 | -0.4 | -4.7 | -0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 1 | -0.3 | -3.2 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 3 | -0.2 | -1.8 | 0.0 | n/a | n/a |
| Oct-77 | 0 | 0 | -1 | -0.2 | -1.7 | -0.3 | n/a | n/a |
| Nov-77 | 0 | 0 | 2 | -0.2 | -2.3 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 6 | -0.3 | -5.1 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | -3 | -0.7 | -5.2 | -0.4 | n/a | n/a |
| Feb-78 | 0 | 0 | -8 | -1.2 | -8.1 | -0.8 | n/a | n/a |
| Mar-78 | 0 | 0 | -3 | -1.0 | -5.9 | -0.4 | n/a | n/a |
| Apr-78 | 0 | 0 | -1 | -0.3 | -2.7 | -0.1 | n/a | n/a |
| May-78 | 0 | 0 | -1 | -0.1 | -1.2 | -0.1 | n/a | n/a |
| Jun-78 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 1 | ***3.1*** | 17.9 | 0.5 | n/a | n/a |
| Aug-78 | 0 | 0 | 5 | 0.3 | 4.2 | 0.4 | n/a | n/a |
| Sep-78 | 0 | 0 | **20** | 0.0 | 3.7 | 0.9 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 6 | -0.1 | 1.6 | 0.2 | n/a | n/a |
| Nov-78 | 0 | 0 | 1 | -0.1 | -0.3 | 0.0 | n/a | n/a |
| Dec-78 | 0 | 0 | 6 | -0.1 | -0.7 | 0.1 | n/a | n/a |
| Jan-79 | 0 | 0 | 5 | -0.4 | -3.4 | 0.0 | n/a | n/a |
| Feb-79 | 0 | 0 | -5 | -1.0 | -7.9 | -0.6 | n/a | n/a |
| Mar-79 | 0 | 0 | -4 | -0.7 | -5.6 | -0.4 | n/a | n/a |
| Apr-79 | 0 | 0 | -1 | -0.2 | -2.5 | -0.1 | n/a | n/a |
| May-79 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | n/a | n/a |
| ***Jun-79*** | 350 | 0 | -1 | 0.2 | 1.6 | 0.0 | n/a | n/a |
| ***Jul-79*** | 1415 | 1558 | 0 | ***2.5*** | 15.2 | 0.4 | n/a | n/a |
| Aug-79 | 0 | 0 | 6 | 0.2 | 3.3 | 0.4 | n/a | n/a |
| Sep-79 | 0 | 0 | **22** | -0.1 | 2.6 | 0.9 | n/a | n/a |
| Oct-79 | 0 | 0 | **12** | -0.1 | 1.3 | 0.6 | n/a | n/a |
| Nov-79 | 0 | 0 | 4 | -0.1 | -1.3 | 0.1 | n/a | n/a |
| Dec-79 | 0 | 0 | **11** | -0.2 | -2.7 | 0.4 | n/a | n/a |
| Jan-80 | 0 | 0 | 0 | -0.7 | -5.7 | -0.2 | n/a | n/a |
| Feb-80 | 0 | 0 | 7 | 0.2 | 0.9 | 0.6 | n/a | n/a |
| Mar-80 | 0 | 0 | 1 | -0.4 | -2.2 | 0.1 | n/a | n/a |
| Apr-80 | 0 | 0 | -1 | -0.3 | -3.2 | -0.1 | n/a | n/a |
| May-80 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | n/a | n/a |
| Jun-80 | 0 | 0 | -1 | -0.2 | -1.7 | -0.1 | n/a | n/a |
| ***Jul-80*** | 1844 | 1601 | -2 | ***2.2*** | 17.7 | 0.2 | n/a | n/a |
| Aug-80 | 0 | 0 | 3 | 0.3 | 3.6 | 0.3 | n/a | n/a |
| Sep-80 | 0 | 0 | **22** | 0.0 | 2.9 | 1.1 | n/a | n/a |
| ***Oct-80*** | 49 | 0 | 8 | -0.1 | 1.3 | 0.3 | n/a | n/a |
| Nov-80 | 0 | 0 | -2 | -0.1 | -0.6 | -0.1 | n/a | n/a |
| Dec-80 | 0 | 0 | -6 | -0.1 | -1.1 | -0.3 | n/a | n/a |
| Jan-81 | 0 | 0 | -7 | -0.2 | -3.9 | -0.5 | n/a | n/a |
| Feb-81 | 0 | 0 | -7 | -0.4 | -6.1 | -0.6 | n/a | n/a |
| Mar-81 | 0 | 0 | -2 | -0.5 | -0.1 | -0.1 | n/a | n/a |
| Apr-81 | 0 | 0 | -3 | -0.4 | -3.9 | -0.3 | n/a | n/a |

Table 2B-18 Monthly Average Water Quality Change at
Los Vaqueros Reservoir Intake: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| ***May-81*** | 19 | 0 | -1 | -0.2 | -2.7 | -0.1 | n/a | n/a |
| ***Jun-81*** | 439 | 0 | -1 | 0.0 | -0.3 | -0.1 | n/a | n/a |
| ***Jul-81*** | 664 | 263 | -1 | 0.6 | 6.3 | 0.1 | n/a | n/a |
| Aug-81 | 0 | 0 | 6 | -0.1 | 0.8 | 0.2 | n/a | n/a |
| Sep-81 | 0 | 0 | **15** | -0.1 | 1.4 | 0.6 | n/a | n/a |
| Oct-81 | 0 | 0 | 6 | -0.1 | 1.1 | 0.1 | n/a | n/a |
| Nov-81 | 0 | 0 | -7 | -0.1 | -1.2 | -0.4 | n/a | n/a |
| Dec-81 | 0 | 0 | -4 | -0.2 | -1.8 | -0.3 | n/a | n/a |
| Jan-82 | 0 | 0 | -5 | -0.9 | -5.4 | -0.5 | n/a | n/a |
| Feb-82 | 0 | 0 | -1 | -0.4 | -2.7 | -0.1 | n/a | n/a |
| Mar-82 | 0 | 0 | -1 | -1.3 | -8.9 | -0.4 | n/a | n/a |
| Apr-82 | 0 | 0 | 0 | -0.4 | -2.4 | -0.1 | n/a | n/a |
| May-82 | 0 | 0 | 0 | -0.2 | 3.3 | -0.1 | n/a | n/a |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.2 | -0.1 | n/a | n/a |
| ***Jul-82*** | 1636 | 1613 | -5 | **3.6** | 19.0 | 0.1 | n/a | n/a |
| Aug-82 | 0 | 0 | 4 | 0.4 | 5.2 | 0.4 | n/a | n/a |
| Sep-82 | 0 | 0 | **26** | 0.0 | 3.8 | 1.2 | n/a | n/a |
| Oct-82 | 0 | 0 | 5 | 0.0 | 0.2 | 0.3 | n/a | n/a |
| Nov-82 | 0 | 0 | -2 | -0.1 | -1.0 | -0.2 | n/a | n/a |
| Dec-82 | 0 | 0 | -9 | -0.5 | -0.5 | -0.6 | n/a | n/a |
| Jan-83 | 0 | 0 | 1 | 0.0 | 0.1 | 0.1 | n/a | n/a |
| Feb-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | n/a | n/a |
| Mar-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | n/a | n/a |
| Apr-83 | 0 | 0 | 0 | -0.3 | -2.0 | -0.1 | n/a | n/a |
| May-83 | 0 | 0 | -1 | -0.4 | -3.0 | -0.1 | n/a | n/a |
| Jun-83 | 0 | 0 | 0 | -0.1 | -0.9 | 0.0 | n/a | n/a |
| Jul-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | n/a | n/a |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.2 | -0.1 | n/a | n/a |
| Sep-83 | 0 | 0 | 1 | -0.1 | -0.8 | 0.0 | n/a | n/a |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | n/a | n/a |
| Nov-83 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | n/a | n/a |
| Dec-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | n/a | n/a |
| Jan-84 | 0 | 0 | 0 | -0.4 | -1.4 | -0.2 | n/a | n/a |
| Feb-84 | 0 | 0 | 1 | -0.4 | 1.0 | 0.1 | n/a | n/a |
| Mar-84 | 0 | 0 | 0 | -0.3 | -2.7 | -0.1 | n/a | n/a |
| ***Apr-84*** | 188 | 0 | -1 | 0.1 | 0.6 | -0.1 | n/a | n/a |
| May-84 | 0 | 0 | -1 | -0.2 | -2.3 | -0.1 | n/a | n/a |
| ***Jun-84*** | 731 | 0 | -2 | 0.6 | 5.4 | 0.0 | n/a | n/a |
| ***Jul-84*** | 873 | 1535 | -5 | **2.6** | 13.7 | 0.0 | n/a | n/a |
| Aug-84 | 0 | 0 | -2 | 0.1 | 2.4 | -0.1 | n/a | n/a |
| Sep-84 | 0 | 0 | **19** | 0.0 | 3.5 | 0.8 | n/a | n/a |
| Oct-84 | 0 | 0 | 10 | -0.1 | 3.3 | 0.3 | n/a | n/a |
| Nov-84 | 0 | 0 | -16 | -0.1 | -0.3 | -0.8 | n/a | n/a |
| Dec-84 | 0 | 0 | -11 | -0.2 | -1.8 | -0.7 | n/a | n/a |
| ***Jan-85*** | 399 | 0 | 1 | -0.3 | 2.2 | 0.1 | n/a | n/a |
| ***Feb-85*** | 61 | 0 | 0 | -0.3 | 1.4 | 0.1 | n/a | n/a |
| Mar-85 | 0 | 0 | -1 | -0.5 | 0.0 | 0.0 | n/a | n/a |
| Apr-85 | 0 | 0 | -2 | -0.4 | 2.0 | -0.1 | n/a | n/a |
| May-85 | 0 | 0 | -1 | -0.3 | -2.9 | -0.2 | n/a | n/a |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.6 | -0.1 | n/a | n/a |
| ***Jul-85*** | 38 | 0 | 4 | -0.2 | -1.5 | 0.1 | n/a | n/a |
| Aug-85 | 0 | 0 | 8 | -0.1 | -1.6 | 0.3 | n/a | n/a |
| Sep-85 | 0 | 0 | 3 | -0.1 | -2.7 | 0.0 | n/a | n/a |
| Oct-85 | 0 | 0 | 0 | -0.1 | -2.2 | -0.1 | n/a | n/a |
| Nov-85 | 0 | 0 | -4 | -0.1 | -1.0 | -0.3 | n/a | n/a |
| Dec-85 | 0 | 0 | 0 | -0.2 | -1.8 | -0.2 | n/a | n/a |
| Jan-86 | 0 | 0 | 0 | -0.3 | -2.5 | -0.1 | n/a | n/a |
| Feb-86 | 0 | 0 | 1 | -0.6 | -4.2 | 0.0 | n/a | n/a |
| Mar-86 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | n/a | n/a |
| Apr-86 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | n/a | n/a |
| ***May-86*** | 290 | 0 | 0 | 0.2 | 1.4 | 0.0 | n/a | n/a |
| Jun-86 | 0 | 0 | -1 | -0.2 | -2.0 | -0.1 | n/a | n/a |
| ***Jul-86*** | 1637 | 1535 | -8 | **3.6** | 19.1 | 0.0 | n/a | n/a |
| Aug-86 | 0 | 0 | -7 | 0.2 | 0.0 | -0.4 | n/a | n/a |
| Sep-86 | 0 | 0 | **12** | -0.1 | 1.9 | 0.6 | n/a | n/a |
| Oct-86 | 0 | 0 | -21 | -0.1 | 1.5 | -1.0 | n/a | n/a |
| Nov-86 | 0 | 0 | -12 | -0.1 | -0.6 | -0.6 | n/a | n/a |

Table 2B-18 Monthly Average Water Quality Change at
Los Vaqueros Reservoir Intake: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | Δ Chloride [mg/l] | Δ DOC [mg/l] | Δ TTHM [ug/l] | Δ Bromate [ug/l] | Δ 3-Year Chloride [% Diff] | Δ 3-Year DOC [% Diff] |
|---|---|---|---|---|---|---|---|---|
| Dec-86 | 0 | 0 | -5 | -0.2 | -1.8 | -0.4 | n/a | n/a |
| Jan-87 | 0 | 0 | -2 | -0.4 | -4.1 | -0.4 | n/a | n/a |
| Feb-87 | 0 | 0 | -9 | -0.4 | -4.8 | -0.3 | n/a | n/a |
| Mar-87 | 0 | 0 | -8 | -0.6 | -8.2 | -0.7 | n/a | n/a |
| Apr-87 | 0 | 0 | -3 | -0.4 | -4.4 | -0.3 | n/a | n/a |
| ***May-87*** | 414 | 0 | -2 | 0.0 | -1.0 | -0.1 | n/a | n/a |
| ***Jun-87*** | 517 | 0 | 0 | 0.2 | 1.8 | 0.1 | n/a | n/a |
| ***Jul-87*** | 54 | 5 | 2 | -0.1 | -0.6 | 0.1 | n/a | n/a |
| Aug-87 | 0 | 0 | 5 | -0.2 | -0.8 | 0.1 | n/a | n/a |
| Sep-87 | 0 | 0 | 0 | -0.1 | -1.4 | -0.1 | n/a | n/a |
| Oct-87 | 0 | 0 | -5 | -0.1 | -1.1 | -0.3 | n/a | n/a |
| Nov-87 | 0 | 0 | -7 | -0.2 | -1.6 | -0.4 | n/a | n/a |
| Dec-87 | 0 | 0 | -1 | -0.2 | -1.4 | -0.2 | n/a | n/a |
| Jan-88 | 0 | 0 | 1 | -0.3 | -1.9 | -0.1 | n/a | n/a |
| ***Feb-88*** | 139 | 0 | 1 | -0.4 | -3.1 | 0.0 | n/a | n/a |
| Mar-88 | 0 | 0 | 1 | -0.7 | -5.2 | -0.1 | n/a | n/a |
| Apr-88 | 0 | 0 | -1 | -0.5 | 0.2 | 0.0 | n/a | n/a |
| May-88 | 0 | 0 | -1 | -0.4 | -4.3 | -0.2 | n/a | n/a |
| Jun-88 | 0 | 0 | -1 | -0.4 | 2.4 | 0.0 | n/a | n/a |
| Jul-88 | 0 | 0 | -1 | -0.5 | -5.4 | -0.3 | n/a | n/a |
| Aug-88 | 0 | 0 | 2 | -0.4 | -4.4 | -0.1 | n/a | n/a |
| Sep-88 | 0 | 0 | 5 | -0.2 | -2.1 | 0.0 | n/a | n/a |
| Oct-88 | 0 | 0 | 7 | -0.2 | -1.9 | 0.1 | n/a | n/a |
| Nov-88 | 0 | 0 | 7 | -0.2 | -1.4 | 0.1 | n/a | n/a |
| Dec-88 | 0 | 0 | 7 | -0.2 | -1.8 | 0.1 | n/a | n/a |
| Jan-89 | 0 | 0 | 4 | -0.3 | -3.5 | -0.1 | n/a | n/a |
| Feb-89 | 0 | 0 | 3 | -0.6 | -6.7 | -0.2 | n/a | n/a |
| Mar-89 | 0 | 0 | 0 | -0.4 | -3.1 | -0.1 | n/a | n/a |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.8 | -0.1 | n/a | n/a |
| May-89 | 0 | 0 | -1 | -0.3 | -2.6 | -0.1 | n/a | n/a |
| ***Jun-89*** | 60 | 0 | -2 | -0.2 | -1.9 | -0.2 | n/a | n/a |
| ***Jul-89*** | 105 | 0 | 3 | -0.3 | -2.1 | 0.0 | n/a | n/a |
| Aug-89 | 0 | 0 | 5 | -0.2 | -1.7 | 0.1 | n/a | n/a |
| Sep-89 | 0 | 0 | 4 | -0.1 | 0.1 | 0.1 | n/a | n/a |
| Oct-89 | 0 | 0 | -4 | -0.1 | 0.0 | -0.3 | n/a | n/a |
| Nov-89 | 0 | 0 | -1 | -0.2 | -1.5 | -0.2 | n/a | n/a |
| Dec-89 | 0 | 0 | 0 | -0.2 | -2.6 | -0.2 | n/a | n/a |
| Jan-90 | 0 | 0 | -5 | -0.3 | -2.4 | -0.5 | n/a | n/a |
| Feb-90 | 0 | 0 | -2 | -0.5 | -4.0 | -0.3 | n/a | n/a |
| Mar-90 | 0 | 0 | 0 | -0.4 | -3.6 | -0.1 | n/a | n/a |
| Apr-90 | 0 | 0 | -1 | -0.6 | -5.7 | -0.3 | n/a | n/a |
| May-90 | 0 | 0 | -1 | -0.4 | -4.0 | -0.2 | n/a | n/a |
| Jun-90 | 0 | 0 | -3 | -0.4 | -4.3 | -0.3 | n/a | n/a |
| Jul-90 | 0 | 0 | -2 | -0.6 | 0.5 | -0.1 | n/a | n/a |
| Aug-90 | 0 | 0 | 2 | -0.4 | 2.9 | 0.2 | n/a | n/a |
| Sep-90 | 0 | 0 | 0 | -0.2 | -1.6 | -0.2 | n/a | n/a |
| Oct-90 | 0 | 0 | -2 | -0.2 | -1.6 | -0.3 | n/a | n/a |
| Nov-90 | 0 | 0 | 2 | -0.2 | -1.9 | -0.1 | n/a | n/a |
| Dec-90 | 0 | 0 | 2 | -0.3 | -2.5 | -0.1 | n/a | n/a |
| Jan-91 | 0 | 0 | -2 | -0.5 | -5.4 | -0.5 | n/a | n/a |
| Feb-91 | 0 | 0 | -5 | -0.9 | -3.2 | -0.5 | n/a | n/a |
| Mar-91 | 0 | 0 | -3 | -0.5 | -4.8 | -0.4 | n/a | n/a |
| Apr-91 | 0 | 0 | -1 | -0.3 | -2.6 | -0.1 | n/a | n/a |
| May-91 | 0 | 0 | -1 | -0.3 | -2.7 | -0.1 | n/a | n/a |
| Jun-91 | 0 | 0 | -1 | -0.4 | 1.6 | 0.0 | n/a | n/a |
| Jul-91 | 0 | 0 | -1 | -0.5 | 0.6 | 0.0 | n/a | n/a |
| Aug-91 | 0 | 0 | 2 | -0.5 | 2.8 | 0.2 | n/a | n/a |
| Sep-91 | 0 | 0 | 6 | -0.2 | -1.7 | 0.1 | n/a | n/a |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-19 Monthly Average Water Quality Change at
Banks Pumping Plant: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Oct-75 | 0 | 0 | 9 | -0.1 | 0.5 | 0.3 | n/a | n/a |
| ***Nov-75*** | 49 | 0 | -4 | 0.0 | -0.8 | -0.2 | n/a | n/a |
| Dec-75 | 0 | 0 | -7 | -0.1 | -2.2 | -0.4 | n/a | n/a |
| Jan-76 | 0 | 0 | -14 | -0.2 | -4.6 | -0.8 | n/a | n/a |
| Feb-76 | 0 | 0 | -15 | -0.3 | -7.1 | -0.9 | n/a | n/a |
| Mar-76 | 0 | 0 | -7 | -0.4 | -5.8 | -0.6 | n/a | n/a |
| Apr-76 | 0 | 0 | 7 | -0.4 | -2.8 | 0.1 | n/a | n/a |
| May-76 | 0 | 0 | 0 | -0.3 | -3.6 | -0.1 | n/a | n/a |
| Jun-76 | 0 | 0 | -1 | -0.3 | -3.9 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 1 | -0.3 | -3.4 | -0.1 | n/a | n/a |
| Aug-76 | 0 | 0 | 5 | -0.2 | -1.7 | 0.1 | n/a | n/a |
| Sep-76 | 0 | 0 | 1 | -0.1 | -1.2 | 0.0 | n/a | n/a |
| Oct-76 | 0 | 0 | 0 | -0.1 | -2.0 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 2 | -0.1 | -1.3 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 0 | -0.2 | -1.7 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 2 | -0.4 | -3.8 | -0.2 | n/a | n/a |
| Feb-77 | 0 | 0 | 0 | -0.5 | 2.4 | 0.1 | n/a | n/a |
| Mar-77 | 0 | 0 | 0 | -0.2 | -3.1 | -0.2 | n/a | n/a |
| Apr-77 | 0 | 0 | 2 | -0.4 | -4.8 | -0.2 | n/a | n/a |
| May-77 | 0 | 0 | 1 | -0.4 | -5.0 | -0.2 | n/a | n/a |
| Jun-77 | 0 | 0 | 0 | -0.4 | -6.2 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 1 | -0.4 | 2.6 | 0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 1 | -0.3 | -3.8 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 2 | -0.2 | -2.4 | 0.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 0 | -0.2 | -3.8 | -0.2 | n/a | n/a |
| Nov-77 | 0 | 0 | 2 | -0.2 | -2.2 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 4 | -0.2 | -2.2 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | -1 | -0.6 | -3.7 | -0.3 | n/a | n/a |
| Feb-78 | 0 | 0 | -2 | -0.6 | -3.3 | -0.3 | n/a | n/a |
| Mar-78 | 0 | 0 | -1 | -0.4 | -2.4 | -0.2 | n/a | n/a |
| Apr-78 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | n/a | n/a |
| May-78 | 0 | 0 | 0 | -0.1 | -0.9 | 0.0 | n/a | n/a |
| Jun-78 | 0 | 0 | -1 | -0.1 | -1.1 | -0.1 | n/a | n/a |
| ***Jul-78*** | 1844 | 1617 | 1 | ***3.5*** | 20.9 | 0.6 | n/a | n/a |
| Aug-78 | 0 | 0 | 4 | 0.4 | 4.6 | 0.4 | n/a | n/a |
| Sep-78 | 0 | 0 | **15** | 0.0 | 3.2 | 0.7 | n/a | n/a |
| ***Oct-78*** | 28 | 0 | 5 | 0.0 | 0.4 | 0.2 | 0.7 | 1.4 |
| Nov-78 | 0 | 0 | 1 | -0.1 | -0.8 | 0.0 | -0.4 | 1.2 |
| Dec-78 | 0 | 0 | 3 | -0.1 | -0.6 | 0.1 | 0.7 | 1.9 |
| Jan-79 | 0 | 0 | 4 | -0.3 | 3.4 | 0.3 | 0.2 | 1.4 |
| Feb-79 | 0 | 0 | -1 | -0.4 | -2.2 | -0.2 | 1.7 | 1.4 |
| Mar-79 | 0 | 0 | -1 | -0.3 | -1.9 | -0.2 | 2.2 | 1.5 |
| Apr-79 | 0 | 0 | 0 | -0.2 | 3.4 | 0.1 | 1.6 | 1.0 |
| May-79 | 0 | 0 | 0 | -0.1 | -1.3 | -0.1 | 1.9 | 1.4 |
| ***Jun-79*** | 350 | 0 | -1 | 0.5 | 4.6 | 0.1 | 1.8 | 1.3 |
| ***Jul-79*** | 1415 | 1558 | 0 | ***2.8*** | 17.0 | 0.5 | 2.0 | 2.0 |
| Aug-79 | 0 | 0 | 5 | 0.2 | **3.5** | 0.4 | 2.7 | ***6.8*** |
| Sep-79 | 0 | 0 | **16** | -0.1 | 2.4 | 0.7 | 2.2 | ***6.4*** |
| Oct-79 | 0 | 0 | **14** | -0.1 | 1.2 | 0.5 | 3.9 | ***6.9*** |
| Nov-79 | 0 | 0 | 3 | -0.1 | -0.5 | 0.1 | 4.2 | ***6.8*** |
| Dec-79 | 0 | 0 | 8 | -0.1 | -0.1 | 0.3 | 4.5 | ***6.8*** |
| Jan-80 | 0 | 0 | 2 | -0.1 | -0.3 | 0.1 | 4.3 | ***6.3*** |
| Feb-80 | 0 | 0 | 0 | 0.0 | -0.2 | 0.0 | 4.5 | ***5.7*** |
| Mar-80 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | 4.6 | ***6.1*** |
| Apr-80 | 0 | 0 | 0 | -0.1 | -1.3 | -0.1 | 4.9 | ***6.1*** |
| May-80 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | ***5.1*** | ***6.1*** |
| Jun-80 | 0 | 0 | -1 | -0.1 | -1.3 | -0.1 | 5.0 | ***5.9*** |
| ***Jul-80*** | 1844 | 1601 | -4 | ***3.6*** | 19.5 | 0.2 | 4.9 | ***5.8*** |
| Aug-80 | 0 | 0 | 2 | 0.3 | 3.0 | 0.2 | ***5.6*** | ***9.8*** |
| Sep-80 | 0 | 0 | **16** | -0.1 | 2.3 | 0.8 | ***5.4*** | ***9.7*** |
| ***Oct-80*** | 49 | 0 | 7 | 0.0 | 1.0 | 0.3 | ***6.5*** | ***9.7*** |
| Nov-80 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | ***6.2*** | ***9.4*** |
| Dec-80 | 0 | 0 | -3 | -0.1 | -1.2 | -0.2 | ***6.2*** | ***9.3*** |
| Jan-81 | 0 | 0 | -5 | -0.2 | -2.6 | -0.4 | ***5.1*** | ***9.1*** |
| Feb-81 | 0 | 0 | -4 | -0.3 | -3.4 | -0.4 | 4.9 | ***10.2*** |
| Mar-81 | 0 | 0 | -2 | -0.3 | 2.4 | 0.0 | 5.0 | ***10.8*** |
| Apr-81 | 0 | 0 | -3 | -0.4 | -4.1 | -0.2 | 4.8 | ***10.8*** |

Table 2B-19 Monthly Average Water Quality Change at
Banks Pumping Plant: High-Bookend Scenario

| Date<br>[month] | Bacon Releases<br>[cfs] | Webb Releases<br>[cfs] | Δ Chloride<br>[mg/l] | Δ DOC<br>[mg/l] | Δ TTHM<br>[ug/l] | Δ Bromate<br>[ug/l] | Δ 3-Year Chloride<br>[% Diff] | Δ 3-Year DOC<br>[% Diff] |
|---|---|---|---|---|---|---|---|---|
| **May-81** | 19 | 0 | -1 | -0.2 | -2.1 | -0.1 | 4.8 | **11.2** |
| **Jun-81** | 439 | 0 | -1 | 0.3 | 2.3 | 0.0 | 4.8 | **11.4** |
| **Jul-81** | 664 | 263 | -1 | 0.9 | 8.2 | 0.2 | 4.9 | **12.0** |
| Aug-81 | 0 | 0 | 4 | -0.1 | -0.7 | 0.1 | 4.1 | **8.1** |
| Sep-81 | 0 | 0 | **11** | -0.1 | 0.8 | 0.4 | 4.7 | **8.6** |
| Oct-81 | 0 | 0 | 6 | -0.1 | -0.3 | 0.2 | 4.1 | **8.7** |
| Nov-81 | 0 | 0 | -5 | -0.1 | -2.2 | -0.3 | 3.9 | **8.8** |
| Dec-81 | 0 | 0 | -3 | -0.1 | -1.4 | -0.2 | 3.7 | **8.7** |
| Jan-82 | 0 | 0 | -2 | -0.5 | -2.7 | -0.2 | 4.6 | **8.6** |
| Feb-82 | 0 | 0 | 0 | -0.2 | -0.8 | 0.0 | 4.3 | **8.0** |
| Mar-82 | 0 | 0 | 0 | -0.1 | -0.9 | 0.0 | 4.2 | **7.9** |
| Apr-82 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 4.3 | **8.1** |
| May-82 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | 4.1 | **7.8** |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 4.2 | **7.6** |
| **Jul-82** | 1636 | 1613 | -7 | **4.1** | 22.2 | 0.2 | 4.0 | **6.9** |
| Aug-82 | 0 | 0 | 1 | 0.4 | 4.5 | 0.2 | 4.1 | **7.6** |
| Sep-82 | 0 | 0 | **19** | 0.0 | 2.8 | 0.9 | 4.9 | **8.6** |
| Oct-82 | 0 | 0 | 3 | 0.0 | 0.3 | 0.2 | **5.0** | **8.1** |
| Nov-82 | 0 | 0 | -1 | -0.1 | -0.8 | -0.1 | 4.7 | **7.5** |
| Dec-82 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 4.1 | **6.7** |
| Jan-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 3.8 | **6.6** |
| Feb-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 3.7 | **7.2** |
| Mar-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 3.6 | **6.7** |
| Apr-83 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.6 | **6.6** |
| May-83 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.6 | **6.5** |
| Jun-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 3.7 | **6.5** |
| Jul-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 3.7 | **6.4** |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 2.8 | 2.4 |
| Sep-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 2.8 | 2.3 |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.6 | 0.0 | 1.8 | 2.1 |
| Nov-83 | 0 | 0 | 0 | 0.0 | -0.3 | 0.0 | 2.0 | 2.3 |
| Dec-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.3 |
| Jan-84 | 0 | 0 | 0 | -0.1 | -0.3 | 0.0 | 3.4 | 2.6 |
| Feb-84 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 4.0 | 2.7 |
| Mar-84 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 4.0 | 2.6 |
| **Apr-84** | 188 | 0 | -2 | 0.3 | 2.1 | 0.0 | 4.3 | 2.8 |
| May-84 | 0 | 0 | -1 | -0.2 | -1.8 | -0.1 | 4.3 | 3.0 |
| **Jun-84** | 731 | 0 | -4 | **1.2** | 4.6 | 0.0 | 4.3 | 3.0 |
| **Jul-84** | 873 | 1535 | -6 | **2.6** | 13.9 | 0.0 | 4.2 | 3.4 |
| Aug-84 | 0 | 0 | -2 | 0.1 | 0.9 | -0.1 | 4.7 | **5.7** |
| Sep-84 | 0 | 0 | **13** | 0.0 | 2.3 | 0.6 | 3.8 | **5.5** |
| Oct-84 | 0 | 0 | 8 | -0.1 | 0.6 | 0.3 | 3.8 | **5.4** |
| Nov-84 | 0 | 0 | -13 | -0.1 | -3.9 | -0.7 | 4.8 | **5.5** |
| Dec-84 | 0 | 0 | -9 | -0.2 | -2.9 | -0.6 | 3.9 | **5.4** |
| **Jan-85** | 399 | 0 | -1 | -0.2 | -1.0 | -0.1 | 3.2 | **5.5** |
| **Feb-85** | 61 | 0 | 1 | -0.2 | 3.9 | 0.2 | 3.6 | **6.3** |
| Mar-85 | 0 | 0 | -1 | -0.4 | 2.4 | 0.1 | 3.3 | **6.4** |
| Apr-85 | 0 | 0 | -2 | -0.3 | 2.9 | 0.0 | 3.3 | **6.5** |
| May-85 | 0 | 0 | -1 | -0.2 | -2.9 | -0.2 | 3.3 | **6.8** |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.4 | -0.1 | 3.3 | **7.0** |
| **Jul-85** | 38 | 0 | 3 | -0.2 | -1.4 | 0.1 | 3.3 | **7.2** |
| Aug-85 | 0 | 0 | 6 | -0.1 | -0.5 | 0.2 | 2.3 | 2.2 |
| Sep-85 | 0 | 0 | 3 | -0.1 | -0.7 | 0.1 | 2.0 | 1.2 |
| Oct-85 | 0 | 0 | 0 | -0.1 | -1.7 | -0.1 | -0.1 | 1.2 |
| Nov-85 | 0 | 0 | -2 | -0.1 | -1.8 | -0.2 | -0.5 | 1.5 |
| Dec-85 | 0 | 0 | 0 | -0.2 | -1.8 | -0.1 | -0.1 | 2.3 |
| Jan-86 | 0 | 0 | 0 | -0.3 | -1.8 | -0.1 | 0.0 | 2.5 |
| Feb-86 | 0 | 0 | 0 | -0.3 | -1.4 | -0.1 | 0.0 | 2.0 |
| Mar-86 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 0.2 | 2.2 |
| Apr-86 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 0.2 | 2.3 |
| **May-86** | 290 | 0 | 0 | 0.3 | 2.8 | 0.1 | 0.3 | 2.5 |
| Jun-86 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | 0.3 | 2.9 |
| **Jul-86** | 1637 | 1535 | -9 | **4.2** | **22.6** | 0.1 | 0.3 | 2.9 |
| Aug-86 | 0 | 0 | -6 | 0.2 | 0.0 | -0.4 | 1.5 | **8.3** |
| Sep-86 | 0 | 0 | 7 | -0.1 | 0.7 | 0.3 | 1.7 | **8.9** |
| Oct-86 | 0 | 0 | -13 | 0.0 | -3.0 | -0.6 | 1.6 | **8.6** |
| Nov-86 | 0 | 0 | -9 | -0.1 | -2.6 | -0.5 | 0.5 | **8.4** |

Table 2B-19 Monthly Average Water Quality Change at
Banks Pumping Plant: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Dec-86 | 0 | 0 | -3 | -0.1 | -1.5 | -0.2 | 0.3 | **8.5** |
| Jan-87 | 0 | 0 | -1 | -0.2 | -2.5 | -0.2 | 0.7 | **8.8** |
| Feb-87 | 0 | 0 | -4 | -0.3 | -3.9 | -0.4 | 1.2 | **8.9** |
| Mar-87 | 0 | 0 | -5 | -0.4 | -4.7 | -0.4 | 0.4 | **8.5** |
| Apr-87 | 0 | 0 | -3 | -0.4 | -3.7 | -0.3 | 0.1 | **8.2** |
| **May-87** | 414 | 0 | -2 | 0.2 | 1.1 | 0.0 | 0.0 | **7.9** |
| **Jun-87** | 517 | 0 | 0 | 0.6 | 6.2 | 0.2 | 0.2 | **8.3** |
| **Jul-87** | 54 | 5 | 1 | -0.1 | -0.4 | 0.1 | 0.3 | **7.9** |
| Aug-87 | 0 | 0 | 4 | -0.2 | -1.1 | 0.1 | -0.1 | 3.7 |
| Sep-87 | 0 | 0 | 1 | -0.1 | -1.2 | 0.0 | 0.3 | 4.0 |
| Oct-87 | 0 | 0 | -3 | -0.1 | -2.5 | -0.2 | -0.1 | 4.1 |
| Nov-87 | 0 | 0 | -5 | -0.1 | -3.0 | -0.3 | -0.8 | 4.0 |
| Dec-87 | 0 | 0 | -1 | -0.1 | -1.6 | -0.1 | -0.3 | 4.0 |
| Jan-88 | 0 | 0 | 1 | -0.2 | -1.6 | -0.1 | 0.4 | 4.3 |
| **Feb-88** | 139 | 0 | 1 | -0.3 | -1.9 | -0.1 | 0.2 | 3.5 |
| Mar-88 | 0 | 0 | -2 | -0.5 | -4.7 | -0.3 | 0.5 | 3.9 |
| Apr-88 | 0 | 0 | -1 | -0.4 | -3.8 | -0.2 | 0.4 | 3.9 |
| May-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | 0.4 | 3.9 |
| Jun-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | 0.4 | 3.9 |
| Jul-88 | 0 | 0 | -1 | -0.5 | 1.3 | 0.0 | 0.4 | 4.1 |
| Aug-88 | 0 | 0 | 1 | -0.4 | 2.9 | 0.1 | 0.2 | 4.4 |
| Sep-88 | 0 | 0 | 3 | -0.2 | -2.4 | 0.0 | -0.1 | 4.8 |
| Oct-88 | 0 | 0 | 5 | -0.2 | -1.8 | 0.1 | 0.0 | 4.9 |
| Nov-88 | 0 | 0 | 6 | -0.2 | -1.1 | 0.1 | 0.3 | **5.1** |
| Dec-88 | 0 | 0 | 5 | -0.1 | -0.9 | 0.1 | 0.5 | **5.2** |
| Jan-89 | 0 | 0 | 3 | -0.3 | -2.1 | -0.1 | 0.6 | **5.4** |
| Feb-89 | 0 | 0 | 2 | -0.3 | -3.1 | -0.1 | 0.6 | **6.2** |
| Mar-89 | 0 | 0 | 0 | -0.3 | -2.4 | -0.1 | 0.3 | **6.5** |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.4 | -0.1 | 0.3 | **5.3** |
| May-89 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | 0.2 | 4.9 |
| **Jun-89** | 60 | 0 | -2 | -0.1 | -1.2 | -0.1 | 0.1 | 4.0 |
| **Jul-89** | 105 | 0 | 1 | -0.1 | -1.4 | 0.0 | 0.2 | 4.3 |
| Aug-89 | 0 | 0 | 3 | -0.2 | -1.6 | 0.1 | -1.0 | -4.3 |
| Sep-89 | 0 | 0 | 4 | -0.1 | -0.7 | 0.1 | -1.0 | -4.6 |
| Oct-89 | 0 | 0 | -2 | -0.1 | -2.4 | -0.2 | -1.1 | -4.4 |
| Nov-89 | 0 | 0 | -1 | -0.1 | -2.0 | -0.2 | -0.2 | -4.1 |
| Dec-89 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | 0.0 | -4.1 |
| Jan-90 | 0 | 0 | -4 | -0.2 | -3.2 | -0.3 | -0.6 | -4.6 |
| Feb-90 | 0 | 0 | -2 | -0.4 | -4.1 | -0.3 | -1.5 | -5.0 |
| Mar-90 | 0 | 0 | 0 | -0.3 | -2.6 | -0.1 | -0.9 | -4.7 |
| Apr-90 | 0 | 0 | -1 | -0.3 | -3.8 | -0.2 | -0.8 | -4.7 |
| May-90 | 0 | 0 | -1 | -0.4 | -3.7 | -0.2 | -0.8 | -4.7 |
| Jun-90 | 0 | 0 | -1 | -0.3 | 3.2 | 0.0 | -1.1 | -5.3 |
| Jul-90 | 0 | 0 | -2 | -0.6 | 0.6 | -0.1 | -1.4 | -6.4 |
| Aug-90 | 0 | 0 | 1 | -0.4 | 3.0 | 0.1 | -1.5 | -6.4 |
| Sep-90 | 0 | 0 | 1 | -0.2 | -2.3 | -0.1 | -1.4 | -6.3 |
| Oct-90 | 0 | 0 | -2 | -0.2 | -3.6 | -0.2 | -1.6 | -6.4 |
| Nov-90 | 0 | 0 | 1 | -0.2 | -2.4 | -0.1 | -1.1 | -6.2 |
| Dec-90 | 0 | 0 | 1 | -0.2 | -1.7 | -0.1 | -1.2 | -6.4 |
| Jan-91 | 0 | 0 | 0 | -0.4 | -3.8 | -0.3 | -1.4 | -6.6 |
| Feb-91 | 0 | 0 | -4 | -0.6 | -0.2 | -0.2 | -2.0 | -7.2 |
| Mar-91 | 0 | 0 | -2 | -0.4 | -4.5 | -0.3 | -1.8 | -7.3 |
| Apr-91 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | -2.0 | -7.6 |
| May-91 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | -2.0 | -7.4 |
| Jun-91 | 0 | 0 | -1 | -0.4 | 2.4 | 0.0 | -2.0 | -7.4 |
| Jul-91 | 0 | 0 | -1 | -0.6 | 1.1 | 0.0 | -2.0 | -7.4 |
| Aug-91 | 0 | 0 | 2 | -0.5 | 2.9 | 0.1 | -2.0 | -7.4 |
| Sep-91 | 0 | 0 | 4 | -0.2 | -1.7 | 0.1 | -2.1 | -7.5 |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

Table 2B-20 Monthly Average Water Quality Change at
Tracy Pumping Plant: High-Bookend Scenario

| Date [month] | Bacon Releases [cfs] | Webb Releases [cfs] | Δ Chloride [mg/l] | Δ DOC [mg/l] | Δ TTHM [ug/l] | Δ Bromate [ug/l] | Δ 3-Year Chloride [% Diff] | Δ 3-Year DOC [% Diff] |
|---|---|---|---|---|---|---|---|---|
| Oct-75 | 0 | 0 | 9 | -0.1 | 0.5 | 0.3 | n/a | n/a |
| **Nov-75** | 49 | 0 | -4 | 0.0 | -0.8 | -0.2 | n/a | n/a |
| Dec-75 | 0 | 0 | -6 | -0.1 | -1.9 | -0.3 | n/a | n/a |
| Jan-76 | 0 | 0 | -11 | -0.2 | -3.8 | -0.7 | n/a | n/a |
| Feb-76 | 0 | 0 | -13 | -0.3 | -6.4 | -0.8 | n/a | n/a |
| Mar-76 | 0 | 0 | -6 | -0.3 | -5.5 | -0.5 | n/a | n/a |
| Apr-76 | 0 | 0 | 6 | -0.3 | -2.9 | 0.1 | n/a | n/a |
| May-76 | 0 | 0 | 0 | -0.3 | -3.6 | -0.1 | n/a | n/a |
| Jun-76 | 0 | 0 | -1 | -0.3 | -3.9 | -0.2 | n/a | n/a |
| Jul-76 | 0 | 0 | 1 | -0.3 | -3.4 | -0.1 | n/a | n/a |
| Aug-76 | 0 | 0 | 5 | -0.2 | -1.7 | 0.1 | n/a | n/a |
| Sep-76 | 0 | 0 | 1 | -0.1 | -1.3 | 0.0 | n/a | n/a |
| Oct-76 | 0 | 0 | 0 | -0.1 | -2.0 | -0.1 | n/a | n/a |
| Nov-76 | 0 | 0 | 2 | -0.1 | -1.3 | 0.0 | n/a | n/a |
| Dec-76 | 0 | 0 | 0 | -0.2 | -1.6 | -0.1 | n/a | n/a |
| Jan-77 | 0 | 0 | 2 | -0.4 | -3.3 | -0.2 | n/a | n/a |
| Feb-77 | 0 | 0 | 0 | -0.4 | 2.9 | 0.1 | n/a | n/a |
| Mar-77 | 0 | 0 | 1 | -0.1 | -2.4 | -0.1 | n/a | n/a |
| Apr-77 | 0 | 0 | 1 | -0.4 | -4.7 | -0.2 | n/a | n/a |
| May-77 | 0 | 0 | 1 | -0.4 | -5.0 | -0.2 | n/a | n/a |
| Jun-77 | 0 | 0 | 0 | -0.4 | -6.2 | -0.3 | n/a | n/a |
| Jul-77 | 0 | 0 | 2 | -0.4 | 2.8 | 0.1 | n/a | n/a |
| Aug-77 | 0 | 0 | 1 | -0.3 | -3.8 | -0.1 | n/a | n/a |
| Sep-77 | 0 | 0 | 2 | -0.2 | -2.4 | 0.0 | n/a | n/a |
| Oct-77 | 0 | 0 | 0 | -0.2 | -3.7 | -0.2 | n/a | n/a |
| Nov-77 | 0 | 0 | 1 | -0.2 | -2.2 | -0.1 | n/a | n/a |
| Dec-77 | 0 | 0 | 4 | -0.2 | -2.0 | 0.0 | n/a | n/a |
| Jan-78 | 0 | 0 | 0 | -0.3 | -2.1 | -0.1 | n/a | n/a |
| Feb-78 | 0 | 0 | -1 | -0.3 | -1.7 | -0.2 | n/a | n/a |
| Mar-78 | 0 | 0 | 0 | -0.2 | -1.3 | -0.1 | n/a | n/a |
| Apr-78 | 0 | 0 | 0 | 0.0 | -0.3 | 0.0 | n/a | n/a |
| May-78 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | n/a | n/a |
| Jun-78 | 0 | 0 | -1 | -0.1 | -1.1 | -0.1 | n/a | n/a |
| **Jul-78** | 1844 | 1617 | 1 | ***2.8*** | 20.7 | 0.6 | n/a | n/a |
| Aug-78 | 0 | 0 | 4 | 0.4 | 4.6 | 0.4 | n/a | n/a |
| Sep-78 | 0 | 0 | **15** | 0.0 | 3.2 | 0.7 | n/a | n/a |
| **Oct-78** | 28 | 0 | 5 | 0.0 | 0.5 | 0.2 | -0.3 | -1.6 |
| Nov-78 | 0 | 0 | 1 | -0.1 | -0.8 | 0.0 | -0.4 | -1.6 |
| Dec-78 | 0 | 0 | 3 | -0.1 | -0.4 | 0.1 | -0.4 | -1.7 |
| Jan-79 | 0 | 0 | 3 | -0.2 | 3.8 | 0.3 | 0.8 | -1.3 |
| Feb-79 | 0 | 0 | 0 | -0.2 | -1.1 | -0.1 | 1.4 | -1.3 |
| Mar-79 | 0 | 0 | -1 | -0.1 | -0.8 | -0.1 | 2.0 | -1.1 |
| Apr-79 | 0 | 0 | 0 | -0.2 | -1.3 | 0.0 | 2.2 | -1.0 |
| May-79 | 0 | 0 | 0 | -0.1 | -1.3 | -0.1 | 2.3 | -1.1 |
| **Jun-79** | 350 | 0 | -1 | 0.5 | 4.6 | 0.1 | 2.3 | -1.1 |
| **Jul-79** | 1415 | 1558 | 0 | ***2.8*** | 16.9 | 0.5 | 2.3 | -0.3 |
| Aug-79 | 0 | 0 | 5 | 0.2 | 3.6 | 0.4 | 2.3 | 2.8 |
| Sep-79 | 0 | 0 | **16** | -0.1 | 2.4 | 0.7 | 2.4 | 3.1 |
| Oct-79 | 0 | 0 | **14** | -0.1 | 1.3 | 0.5 | 3.1 | 3.2 |
| Nov-79 | 0 | 0 | 3 | -0.1 | -0.5 | 0.1 | 3.2 | 3.0 |
| Dec-79 | 0 | 0 | 6 | -0.1 | -0.1 | 0.2 | 3.2 | 3.0 |
| Jan-80 | 0 | 0 | 1 | -0.1 | 0.0 | 0.1 | 3.4 | 2.9 |
| Feb-80 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.4 | 3.0 |
| Mar-80 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 3.6 | 3.2 |
| Apr-80 | 0 | 0 | 0 | -0.1 | -0.9 | -0.1 | 3.6 | 3.5 |
| May-80 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 3.6 | 3.5 |
| Jun-80 | 0 | 0 | -1 | -0.1 | -1.3 | -0.1 | 3.6 | 3.4 |
| **Jul-80** | 1844 | 1601 | -4 | ***2.6*** | 19.4 | 0.3 | 3.7 | 3.4 |
| Aug-80 | 0 | 0 | 2 | 0.3 | 3.1 | 0.2 | 3.6 | ***6.0*** |
| Sep-80 | 0 | 0 | **16** | -0.1 | 2.4 | 0.8 | 3.9 | ***6.5*** |
| **Oct-80** | 49 | 0 | 7 | 0.0 | 1.0 | 0.3 | 4.7 | ***6.5*** |
| Nov-80 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 5.0 | ***6.5*** |
| Dec-80 | 0 | 0 | -3 | -0.1 | -1.2 | -0.2 | 4.5 | ***6.2*** |
| Jan-81 | 0 | 0 | -3 | -0.1 | -1.8 | -0.2 | 4.3 | ***6.4*** |
| Feb-81 | 0 | 0 | -4 | -0.2 | -3.1 | -0.3 | 4.2 | ***6.8*** |
| Mar-81 | 0 | 0 | -1 | -0.3 | 2.9 | 0.0 | 4.1 | ***7.3*** |
| Apr-81 | 0 | 0 | -3 | -0.3 | -3.7 | -0.3 | 4.0 | ***7.4*** |

Table 2B-20 Monthly Average Water Quality Change at
Tracy Pumping Plant: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| ***May-81*** | 19 | 0 | -1 | -0.3 | -2.2 | -0.1 | 3.8 | ***7.1*** |
| ***Jun-81*** | 439 | 0 | -1 | 0.2 | 2.2 | 0.0 | 3.7 | ***7.2*** |
| ***Jul-81*** | 664 | 260 | -1 | 0.9 | 8.2 | 0.2 | 3.7 | ***7.6*** |
| Aug-81 | 0 | 0 | 4 | -0.1 | -0.7 | 0.1 | 3.6 | ***5.5*** |
| Sep-81 | 0 | 0 | **11** | -0.1 | 0.8 | 0.4 | 3.5 | ***5.0*** |
| Oct-81 | 0 | 0 | 6 | -0.1 | -0.2 | 0.2 | 3.3 | 4.9 |
| Nov-81 | 0 | 0 | -5 | -0.1 | -2.2 | -0.3 | 3.3 | 4.9 |
| Dec-81 | 0 | 0 | -2 | -0.1 | -1.2 | -0.2 | 3.0 | 5.0 |
| Jan-82 | 0 | 0 | -1 | -0.3 | -1.3 | -0.1 | 2.0 | 4.4 |
| Feb-82 | 0 | 0 | 0 | -0.1 | -0.4 | 0.0 | 1.9 | 4.2 |
| Mar-82 | 0 | 0 | 0 | 0.0 | 0.1 | 0.0 | 1.9 | 4.3 |
| Apr-82 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 2.0 | 4.5 |
| May-82 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 2.2 | 4.9 |
| Jun-82 | 0 | 0 | -1 | -0.1 | -1.0 | -0.1 | 2.3 | ***5.0*** |
| ***Jul-82*** | 1636 | 1613 | -6 | ***4.0*** | 22.0 | 0.2 | 2.3 | 4.5 |
| Aug-82 | 0 | 0 | 1 | 0.4 | 4.7 | 0.2 | 2.0 | ***5.4*** |
| Sep-82 | 0 | 0 | **19** | 0.0 | 2.9 | 0.9 | 1.8 | ***5.6*** |
| Oct-82 | 0 | 0 | 3 | 0.0 | 0.3 | 0.2 | 1.9 | ***5.6*** |
| Nov-82 | 0 | 0 | -1 | -0.1 | -0.8 | -0.1 | 2.1 | ***5.8*** |
| Dec-82 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.9 | ***5.8*** |
| Jan-83 | 0 | 0 | 1 | 0.0 | 0.2 | 0.1 | 1.7 | ***5.8*** |
| Feb-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.7 | ***6.0*** |
| Mar-83 | 0 | 0 | 1 | 0.0 | 0.1 | 0.1 | 1.7 | ***6.1*** |
| Apr-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.6 | ***5.8*** |
| May-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 1.7 | ***5.8*** |
| Jun-83 | 0 | 0 | 0 | -0.1 | -0.8 | 0.0 | 1.7 | ***5.8*** |
| Jul-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 1.8 | ***5.8*** |
| Aug-83 | 0 | 0 | 0 | -0.1 | -1.1 | -0.1 | 2.0 | 3.1 |
| Sep-83 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 1.6 | 2.5 |
| Oct-83 | 0 | 0 | 0 | -0.1 | -0.5 | 0.0 | 0.8 | 2.5 |
| Nov-83 | 0 | 0 | 0 | 0.0 | -0.2 | 0.0 | 0.3 | 2.4 |
| Dec-83 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.9 | 2.7 |
| Jan-84 | 0 | 0 | 0 | 0.0 | -0.1 | 0.0 | 1.2 | 2.8 |
| Feb-84 | 0 | 0 | 0 | -0.1 | -0.3 | 0.0 | 1.4 | 2.9 |
| Mar-84 | 0 | 0 | 0 | -0.1 | -0.7 | 0.0 | 1.7 | 2.9 |
| ***Apr-84*** | 188 | 0 | -1 | 0.2 | 2.2 | 0.0 | 1.8 | 3.1 |
| May-84 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | 2.0 | 3.5 |
| ***Jun-84*** | 731 | 0 | -3 | ***1.2*** | 4.3 | 0.0 | 2.0 | 3.5 |
| ***Jul-84*** | 873 | 1535 | -5 | ***2.6*** | 13.9 | 0.1 | 1.9 | 4.5 |
| Aug-84 | 0 | 0 | -2 | 0.1 | 1.0 | -0.1 | 1.6 | ***6.0*** |
| Sep-84 | 0 | 0 | **13** | 0.0 | 2.3 | 0.6 | 1.1 | ***6.2*** |
| Oct-84 | 0 | 0 | 9 | -0.1 | 0.7 | 0.3 | 1.2 | ***6.3*** |
| Nov-84 | 0 | 0 | -12 | -0.1 | -3.8 | -0.6 | 1.5 | ***6.2*** |
| Dec-84 | 0 | 0 | -7 | -0.1 | -2.5 | -0.5 | 0.9 | ***6.2*** |
| ***Jan-85*** | 399 | 0 | 0 | -0.1 | -0.8 | 0.0 | 0.5 | ***6.2*** |
| ***Feb-85*** | 61 | 0 | 0 | -0.2 | 4.2 | 0.2 | 0.6 | ***6.5*** |
| Mar-85 | 0 | 0 | 0 | -0.3 | 2.8 | 0.1 | 0.5 | ***6.6*** |
| Apr-85 | 0 | 0 | -2 | -0.3 | 3.3 | 0.0 | 0.5 | ***6.2*** |
| May-85 | 0 | 0 | -1 | -0.2 | -2.9 | -0.2 | 0.4 | ***6.2*** |
| Jun-85 | 0 | 0 | -1 | -0.2 | -2.4 | -0.1 | 0.4 | ***6.1*** |
| ***Jul-85*** | 38 | 0 | 3 | -0.2 | -1.4 | 0.1 | 0.3 | ***6.1*** |
| Aug-85 | 0 | 0 | 6 | -0.1 | -0.5 | 0.2 | 0.9 | 2.2 |
| Sep-85 | 0 | 0 | 3 | -0.1 | -0.7 | 0.1 | 1.3 | 1.6 |
| Oct-85 | 0 | 0 | 0 | -0.1 | -1.6 | -0.1 | 0.2 | 1.6 |
| Nov-85 | 0 | 0 | -2 | -0.1 | -1.8 | -0.2 | 0.0 | 1.6 |
| Dec-85 | 0 | 0 | 0 | -0.2 | -1.3 | -0.1 | 0.0 | 1.6 |
| Jan-86 | 0 | 0 | 0 | -0.2 | -1.4 | -0.1 | 0.0 | 1.5 |
| Feb-86 | 0 | 0 | 0 | -0.1 | -0.5 | 0.0 | 0.0 | 1.2 |
| Mar-86 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 |
| Apr-86 | 0 | 0 | 0 | -0.1 | 3.9 | 0.0 | 0.0 | 1.0 |
| ***May-86*** | 290 | 0 | 0 | 0.3 | 2.8 | 0.1 | 0.0 | 1.0 |
| Jun-86 | 0 | 0 | -1 | -0.2 | -1.6 | -0.1 | 0.0 | 1.2 |
| ***Jul-86*** | 1637 | 1535 | -8 | ***4.2*** | 22.1 | 0.1 | -0.1 | 1.2 |
| Aug-86 | 0 | 0 | -7 | 0.2 | 0.5 | -0.3 | -0.1 | 1.8 |
| Sep-86 | 0 | 0 | 7 | -0.1 | 0.7 | 0.3 | 0.4 | 3.0 |
| Oct-86 | 0 | 0 | -13 | 0.0 | -2.9 | -0.6 | 0.7 | 3.0 |
| Nov-86 | 0 | 0 | -9 | -0.1 | -2.6 | -0.5 | 0.1 | 3.0 |

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Table 2B-20 Monthly Average Water Quality Change at
Tracy Pumping Plant: High-Bookend Scenario

| Date | Bacon Releases | Webb Releases | Δ Chloride | Δ DOC | Δ TTHM | Δ Bromate | Δ 3-Year Chloride | Δ 3-Year DOC |
|---|---|---|---|---|---|---|---|---|
| [month] | [cfs] | [cfs] | [mg/l] | [mg/l] | [ug/l] | [ug/l] | [% Diff] | [% Diff] |
| Dec-86 | 0 | 0 | -3 | -0.1 | -1.4 | -0.2 | -0.3 | 3.0 |
| Jan-87 | 0 | 0 | 0 | -0.2 | -2.1 | -0.2 | -1.0 | 2.6 |
| Feb-87 | 0 | 0 | -3 | -0.2 | -3.6 | -0.3 | -1.8 | 2.1 |
| Mar-87 | 0 | 0 | -5 | -0.4 | -4.5 | -0.4 | -1.8 | 2.1 |
| Apr-87 | 0 | 0 | -3 | -0.3 | -3.6 | -0.3 | -1.9 | 1.9 |
| ***May-87*** | 414 | 0 | -2 | 0.2 | 0.9 | 0.0 | -1.9 | 1.5 |
| ***Jun-87*** | 517 | 0 | 0 | 0.6 | 6.2 | 0.2 | -1.9 | 1.8 |
| ***Jul-87*** | 54 | 5 | 1 | -0.1 | -0.4 | 0.1 | -1.8 | 1.2 |
| Aug-87 | 0 | 0 | 4 | -0.2 | -1.2 | 0.1 | -1.5 | -1.4 |
| Sep-87 | 0 | 0 | 1 | -0.1 | -1.3 | 0.0 | -1.3 | -1.7 |
| Oct-87 | 0 | 0 | -2 | -0.1 | -2.4 | -0.2 | -1.8 | -1.8 |
| Nov-87 | 0 | 0 | -5 | -0.1 | -3.0 | -0.4 | -2.2 | -1.8 |
| Dec-87 | 0 | 0 | -1 | -0.1 | -1.4 | -0.1 | -1.9 | -1.7 |
| Jan-88 | 0 | 0 | 1 | -0.2 | -1.4 | -0.1 | -1.5 | -1.7 |
| ***Feb-88*** | 139 | 0 | 1 | -0.3 | -1.6 | -0.1 | -1.5 | -1.8 |
| Mar-88 | 0 | 0 | -2 | -0.5 | -4.6 | -0.3 | -1.5 | -1.8 |
| Apr-88 | 0 | 0 | -1 | -0.4 | -3.7 | -0.2 | -1.4 | -1.6 |
| May-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | -1.4 | -1.6 |
| Jun-88 | 0 | 0 | -1 | -0.4 | -3.9 | -0.2 | -1.4 | -1.6 |
| Jul-88 | 0 | 0 | -1 | -0.5 | 1.4 | 0.0 | -1.4 | -1.6 |
| Aug-88 | 0 | 0 | 1 | -0.4 | 2.9 | 0.1 | -1.6 | -1.6 |
| Sep-88 | 0 | 0 | 3 | -0.2 | -2.4 | 0.0 | -1.9 | -1.7 |
| Oct-88 | 0 | 0 | 5 | -0.2 | -1.8 | 0.1 | -1.9 | -1.7 |
| Nov-88 | 0 | 0 | 6 | -0.2 | -1.1 | 0.1 | -1.8 | -1.8 |
| Dec-88 | 0 | 0 | 4 | -0.1 | -0.8 | 0.1 | -1.6 | -1.8 |
| Jan-89 | 0 | 0 | 3 | -0.2 | -1.9 | 0.0 | -1.4 | -1.8 |
| Feb-89 | 0 | 0 | 1 | -0.2 | -2.1 | -0.1 | -1.3 | -1.8 |
| Mar-89 | 0 | 0 | 0 | -0.3 | -2.2 | -0.1 | -1.3 | -1.9 |
| Apr-89 | 0 | 0 | -1 | -0.2 | -1.4 | -0.1 | -1.2 | -2.2 |
| May-89 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | -1.2 | -2.3 |
| ***Jun-89*** | 60 | 0 | -2 | -0.1 | -1.3 | -0.1 | -1.2 | -2.5 |
| ***Jul-89*** | 105 | 0 | 1 | -0.1 | -1.4 | 0.0 | -1.3 | -2.5 |
| Aug-89 | 0 | 0 | 4 | -0.2 | -1.5 | 0.1 | -1.1 | -3.0 |
| Sep-89 | 0 | 0 | 4 | -0.1 | -0.7 | 0.1 | -1.4 | -4.4 |
| Oct-89 | 0 | 0 | -2 | -0.1 | -2.3 | -0.2 | -1.5 | -4.5 |
| Nov-89 | 0 | 0 | -1 | -0.1 | -2.0 | -0.2 | -1.1 | -4.6 |
| Dec-89 | 0 | 0 | 0 | -0.1 | -1.6 | -0.1 | -0.7 | -4.6 |
| Jan-90 | 0 | 0 | -3 | -0.2 | -2.7 | -0.3 | 0.0 | -4.2 |
| Feb-90 | 0 | 0 | -2 | -0.4 | -3.8 | -0.3 | 0.6 | -3.8 |
| Mar-90 | 0 | 0 | 0 | -0.3 | -2.6 | -0.1 | 0.6 | -3.9 |
| Apr-90 | 0 | 0 | -1 | -0.3 | -3.8 | -0.2 | 0.7 | -3.9 |
| May-90 | 0 | 0 | -1 | -0.4 | -3.8 | -0.2 | 0.8 | -3.8 |
| Jun-90 | 0 | 0 | -1 | -0.3 | 3.3 | 0.0 | 0.8 | -4.1 |
| Jul-90 | 0 | 0 | -2 | -0.5 | 0.6 | -0.1 | 0.9 | -4.9 |
| Aug-90 | 0 | 0 | 1 | -0.4 | 3.0 | 0.1 | 0.8 | -4.9 |
| Sep-90 | 0 | 0 | 1 | -0.2 | -2.5 | -0.1 | 0.6 | -5.1 |
| Oct-90 | 0 | 0 | -2 | -0.3 | -3.6 | -0.2 | 0.6 | -5.1 |
| Nov-90 | 0 | 0 | 1 | -0.2 | -2.4 | -0.1 | 0.7 | -5.1 |
| Dec-90 | 0 | 0 | 1 | -0.2 | -1.6 | -0.1 | 0.9 | -5.1 |
| Jan-91 | 0 | 0 | 0 | -0.3 | -3.3 | -0.3 | 0.9 | -5.2 |
| Feb-91 | 0 | 0 | -3 | -0.5 | -7.3 | -0.5 | 0.8 | -5.4 |
| Mar-91 | 0 | 0 | -2 | -0.4 | -4.0 | -0.3 | 0.9 | -5.5 |
| Apr-91 | 0 | 0 | 0 | -0.2 | -1.5 | -0.1 | 0.7 | -5.7 |
| May-91 | 0 | 0 | -1 | -0.3 | -2.2 | -0.1 | 0.7 | -5.6 |
| Jun-91 | 0 | 0 | -1 | -0.2 | 4.9 | 0.1 | 0.7 | -5.6 |
| Jul-91 | 0 | 0 | -1 | -0.5 | 1.2 | 0.0 | 0.8 | -5.5 |
| Aug-91 | 0 | 0 | 1 | -0.5 | 2.9 | 0.1 | 0.8 | -5.4 |
| Sep-91 | 0 | 0 | 4 | -0.2 | -1.7 | 0.1 | 0.8 | -5.4 |

1. Project Release Months are shown in ***Bold***
2. WQMP Δ Chloride Violations (> 10 mg/l) are shown in ***Bold***
3. WQMP Δ DOC Violations (> 0 - 1 mg/l) are shown in ***Bold***
4. WQMP Δ TTHM Violations (> 3.2 ug/l) are shown in ***Bold***
5. WQMP Δ Bromate Violations (> 0.4 ug/l) are shown in ***Bold***
6. WQMP Δ 3-Year Chloride and Δ 3-Year DOC Violations (> 5%) are shown in ***Bold***

# Chapter 3  Water Quality Field Investigations

## 3.1  Task Description

This executive summary describes a conceptual model and algorithm for modeling organic carbon in the DW Project (DWP) reservoir islands.  A technical report was prepared for the Delta Modeling Section for documentation of the developed algorithm. The technical report (Jung, 2001) includes extensive analysis and interpretation of the reviewed studies and a summary of historical Delta channel and DWP island drainage water quality data (e.g., DOC, $UVA_{254nm}$).  DOC and UVA data are used to validate the DSM2 (Delta Simulation Model 2) model.

The primary sources of data included:

- Tank experiments conducted by the Municipal Water Quality Investigations (MWQI) Program in 1998-2000 at the Department of Water Resources (DWR) SMARTS facility.
- Wetland water quality experiments conducted by the consultants of the DWP on a Holland Tract demonstration pond in 1989-90.
- A drainage and groundwater quality study conducted by the USGS for MWQI at Twitchell Island in 1996-97.
- Published studies and data from university wetlands scientists.
- Reports and testimonies presented during the DW Project EIR/EIS hearings.
- Delta channel and drainage water quality data collected since 1986 by DWR.
- Reports of the MWQI Program and predecessor programs since 1982.

The literature search confirmed that no deep reservoir project on peat soils constructed or operated as proposed in the DW Project existed that could be used as a model. There were data, however, on shallow-flooded wetlands, natural and constructed.

As part of the DW Project study, the Department's MWQI Program participated in development of a water quality module for the DSM2 model to study the operation of the DWP.  The module will simulate organic carbon concentrations in the impounded water of the reservoir islands. The model is generic in the sense that it can be applied to other candidate islands and tracts in the Delta besides the DWP islands.

The general scope of work performed by the MWQI Program consultant and staff included developing a conceptual model and mathematical relationships to predict the changes in organic carbon concentrations in the DWP reservoirs based on existing data.  Explanatory variables included diversion water quality, storage holding time, season, water level, and soil characteristics.  Additional tasks requested by the Integrated Storage Investigations (ISI) Program included developing field and laboratory analyses and experiments to supplement the reconnaissance-level study of the DWP and to refine the assumptions used in the module.

With this information, the Delta Modeling staff of DWR will develop a water balance module that incorporates the concepts and mathematical relationships that were developed and described in this report and link this module to DSM2. Model development and refinement work will continue through 2001 to adopt the modules in the new CALSIM2 model to simulate water quality changes from the IDS alternatives in meeting the WQMP under different State Water Project and Central Valley Project operational conditions.

### 3.2 Major Organic Carbon Model Components

*A complete water quality model for organic carbon production in the reservoir islands of the DW Project should address three major components (Figure 3-1). They are:*

A peat soil DOC release and generation component that predicts the reservoir water organic carbon concentrations from leaching and microbial decay of peat.

A seepage return water component that predicts the amount and concentrations of organic carbon that is captured and cycled back into the reservoir from seepage pumps located along the perimeter of the reservoir island levees.

An algae and wetland plant production component that predicts the contribution of organic carbon from primary productivity in the reservoir.

This report describes the algorithms of the first two components. The third component is being developed under contract by ERA (Ecological Research Associates, Davis, CA).

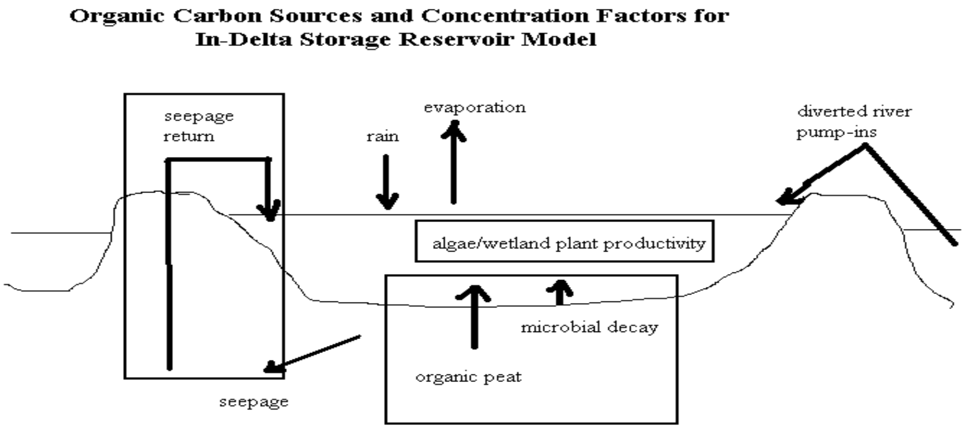
#### *Peat Soil DOC Release and Generation*

The Peat Soil DOC Release and Generation component addresses organic carbon released from the flooded peat soil and its breakdown by microbial communities in the soil, the soil-water interface, and in the water column over time. The only studies that were found that could be used to describe short- and long-term water quality changes in a flooded Delta peat island that is used for a reservoir were performed by DWR.

In 1998 - 2000 the MWQI Program conducted experiments on how water depth, peat soil, and water exchange, such as in a newly created wetland, could affect drinking water constituents of concern. These experiments were conducted at the Department's SMARTS (Special Multipurpose and Research Technology Station) facility. The study objectives were to obtain information for guidance in the planning, creation, and operation of shallow wetlands in the Delta. Eight large tanks (810- and 1500-gallon capacities) with different combinations of peat soil depth (1.5 or 4 ft.), water depth (2 or 7 ft.), and water exchange rates (none or 1.5 times per week) were used. The water quality of the impounded surface water and peat soil pore water was monitored. Two separate experiments were run. Experiment #1 was a three-month study (Jung and Weisser, 1999). Experiment #2 was conducted from January 13, 1999 to January 21,

2000. However, samples were collected in June and September 2000 for comparison of changes after the one-year experiment had officially terminated (Jung and Weisser, 2000).

**Figure 3-1.**




The SMARTS Experiment #2 study showed that DOC production over time (days flooded) in the surface water could be described by a logistic equation and curve. The general equation of the logistics curves that were seen in the tank experiment is:

$$f(t) = \frac{A}{1 + B e^{-kt}}$$

where f(t) represents the DOC concentration in mg/l at time t, A represents the maximum DOC concentration in mg/l, k is the growth rate in days$^{-1}$, and t is the water storage duration in days. B is a coefficient that is calculated from the starting DOC concentration.  The maximum rate of increase is the maximum of the derivative of the logistic equation, y = f(t). It occurs at the point of inflection of f(t). Procedures for solving logistics equations can be found in several college math and engineering textbooks (Coughlin and Zitarelli, 1989; Lial et. Al., 1993; Fair et. Al., 1958).

The SMARTS Experiment #2 study period simulated initial flooding of peat soil beginning in January with water held for 20 months. The study period of Experiment #2 overlapped and extended past the planned operations of the DWP reservoir islands that include filling in the winter months and storing until summer releases.

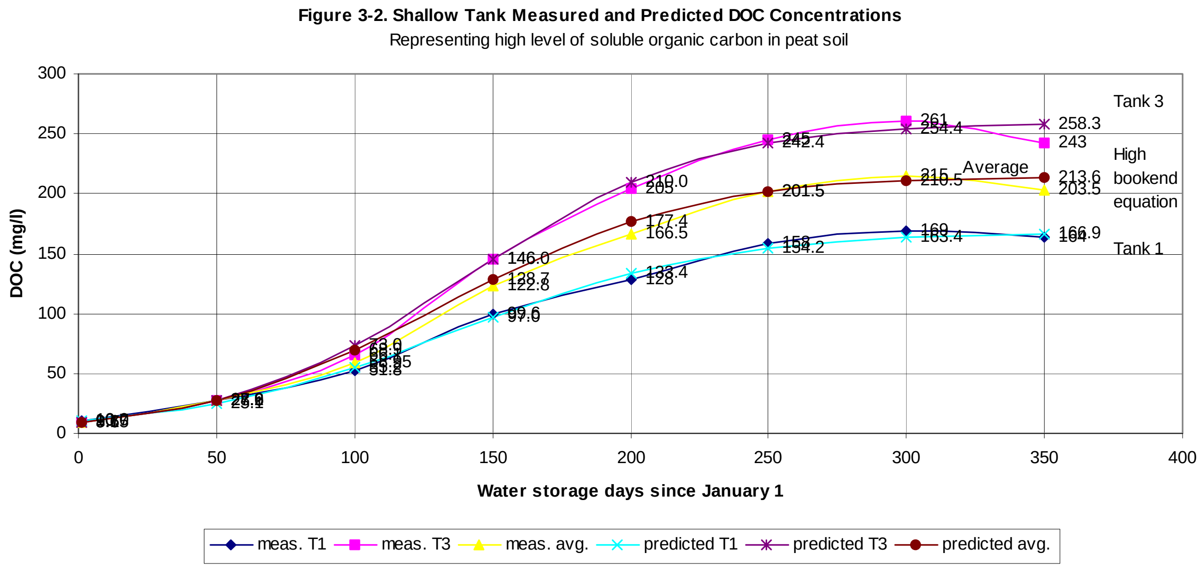
SMARTS Experiment #1 operated for three months (mid-July – early October). The Experiment #1 DOC concentrations over time also followed a logistic equation curve but with a higher growth rate (k) value. This was attributed to the much warmer summer temperatures, which would accelerate microbial decay and TOC/DOC release and production rates in the tanks.

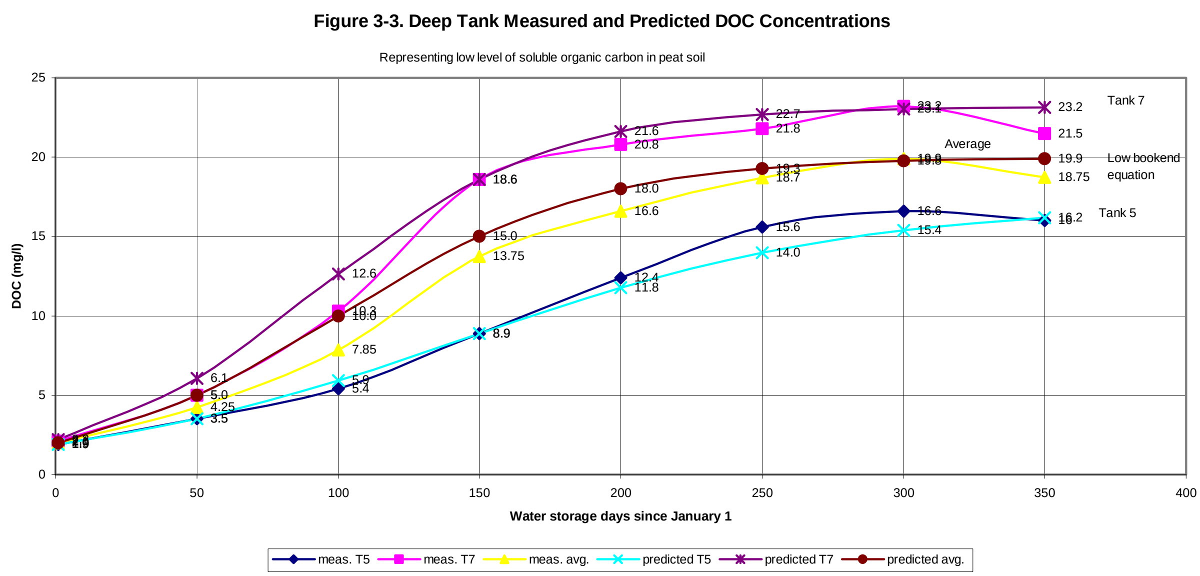
**Photo 3-1. SMARTS tanks at DWR West Sacramento Facility**

A graph showing the predicted maximum DOC concentration over a 360 day water holding period for the predicted logistics equation, measured values in SMARTS Experiment #2 tanks 1 and 3, and the average of the measurements are shown in Figure 3-2. This figure shows the results of submerging peat soil that was high in soluble organic carbon for a year in two feet of water. The Y-axis represents the DOC concentration and the x-axis represents the water storage days since filling a tank to a 2-foot water depth over a peat soil layer of 1.5 and 4 feet in thickness. The dilution water (city tap water) used in the study had a DOC of 1 mg/l. The data was collected semi-monthly for a year. The start of the experiment coincided with the major filling period of the proposed DWP, which is in the winter, December – February. Water was held for over a year to study seasonal water quality changes.

On the basis of the good fit of the observed DOC concentrations and the logistics equation, an algorithm for estimating DOC from the processes of peat soil leaching and microbial decay of peat soil was developed. The logistics equation that represented the average DOC values of tanks 1 and 3 was selected to represent the high bookend equation or value for the model. This equation represented predicted DOC releases from soil with high organic carbon content.

A similar plot of DOC data for tanks 5 and 7 and their average is shown in Figure 3-3. The soil in these two tanks was significantly lower in soluble organic carbon. They were also filled to a water depth of 7 feet, not 2 feet as in tanks 1 and 3. These differences resulted in lower maximum values that were reached (the A variable) in tanks 5 and 7 than in tanks 1 and 3. The logistics equation that represented the average DOC values of tanks 5 and 7 was selected to represent the low bookend equation or value. This equation represented predicted DOC releases from soil with low organic carbon content

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The high and low bookend equations are shown in Table 3-1. Appropriate dilution factors to represent a filled island reservoir (average water depth of 21 feet) will need to be applied to each bookend logistics equation as tanks 1 and 3 were flooded to a 2-foot depth while tanks 5 and 7 were flooded to 7-feet.

**Table 3-1. Bookend Logistics Equations for Model Algorithm**

| **Bookend Condition** | **Logistic Equation DOC (mg/l) = $A/(1+Be^{-kt})$** |
|---|---|
| Low soil organic carbon @ 7 ft. water depth | $20/(1+9e^{-0.022t})$ |
| High soil organic carbon @ 2 ft. water depth | $215/(1+21.22e^{-0.022t})$ |

To compute DOC at time (t) for a 21-foot deep reservoir using Figure 3-2, we would divide the value at f(t) by 10.5 (i.e., 21'/2') and add the dilution water DOC concentration. For example, using the high bookend curve for day 200 in Figure 2, the predicted DOC is 177.4 mg/l for a 2-foot deep reservoir. Diluting this value by 10.5 gives an estimated DOC of 16.9 mg/l in a 21-foot deep reservoir. When the diverted river water DOC concentration, which can range from 4 to 6 mg/l, is added to the computation, the predicted reservoir water DOC can be over 20 mg/l.

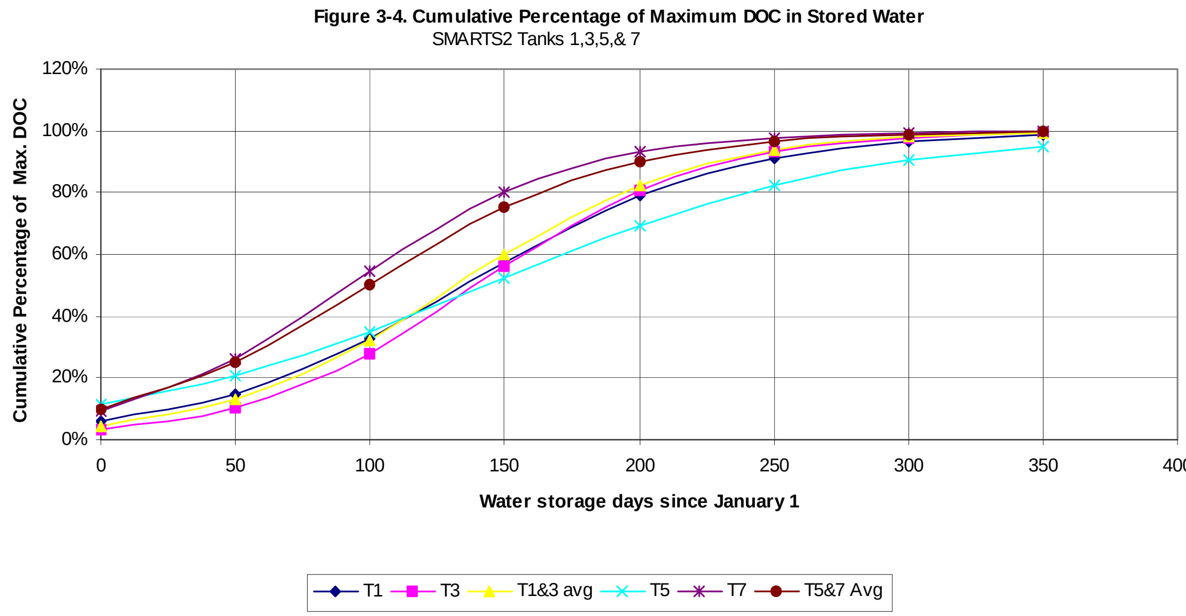
To compute DOC at time (t) for a 21-foot deep reservoir using Figure 3-3, we would divide the value at f(t) by 3 (i.e., 21'/7') and add the dilution water DOC concentration. For example, using the low bookend curve for day 200 in Figure 3, the predicted DOC is 18 mg/l for a 7-foot deep reservoir. Diluting this value by 3 gives an estimated DOC of 6 mg/l in a 21-foot deep reservoir. When the diverted river water DOC concentration, which can range from 4 to 6 mg/l, is added to the computation, the predicted reservoir water DOC can be 7 to 9 mg/l.

A simplified equation that incorporates the logistics equations, dilution factors, and diverted river DOC concentrations can be expressed as:

$$\mathbf{DOC(t) = DOC(0) + F(t)/Df}$$

where DOC (0) is the diverted river DOC in mg/l at filling, F(t) is the high or low bookend logistics equation, and Df is the appropriate dilution factor. The high bookend dilution factor is the reservoir depth (ft.) divided by 2. The low bookend dilution factor is the reservoir depth (ft.) divided by 7.

A plot (Figure 3-4) of the cumulative percentage of the maximum DOC concentration versus time showed that, in spite of different maximum DOC concentrations that observed in the tanks, the rates of DOC accumulation were similar. The data indicated that 50 to 80 percent of the maximum DOC levels may be reached in about 150 days and over 90 percent after 10 months of storage when the reservoir is filled in January.




Growth constants (k) are affected by water temperature, which in turn are affected by season. K values were also computed for each potential calendar month when water might be diverted to fill or top-off the reservoirs. Data from SMARTS Experiment #1 were examined to determine summer k values. The proposed k constants shown in Table 3-2 are based on observed water temperatures and the logistics equations of the two experiments.

**Table 3-2. Model K Values Based on Reservoir Filling Periods**
***K growth rate constant units in per day***

| Reservoir Filling Period | Water temperature range | Low bookend k | High bookend k |
|---|---|---|---|
| November – March | 7 – 12 °C | 0.022 | 0.022 |
| June – October | 20 – 28 °C | 0.042 | 0.070 |

The summer k values appear to be reasonable estimates. The decomposition rate of organic carbon can increase by 2 to 4 times when temperature increases by 10°C within the tolerance limits of the organism (Reddy et. Al., 1980). This factor is called the Q10 value. Experiment #2 water temperatures were 7°to 12°C in November through March. Experiment #1 water temperatures (July to mid-October) were 20° – 28°C. The summer k values (0.04 – 0.07) were 2 – 4 times higher than the winter k values (0.02).

The DSM2 model will predict the diverted river DOC concentrations at the times of filling and compute the reservoir DOC concentrations using the logistics equations in Table 3-1 and the appropriate k values in Table 3-2. In the few cases of reservoir filling in June – October, the low and high bookend k values will replace the k values of the November

– March low and high bookend logistics equations, respectively.  The simulations will represent a 16-year hydrology (1975-1991) and variations in operating the reservoirs.

**<u>Seepage Return</u>**

The Seepage Return component addresses the DOC of seepage water that is returned back to the reservoir island by pumps located along the levees on some sides of the reservoir islands.  A system of large extraction wells installed on the levees has been proposed by DWP owners to protect the adjacent islands from the anticipated effects of seepage from the reservoir islands. Seepage is expected because of the hydraulic pressure exerted by the stored water (average depth 20 ft.) over a deep sand aquifer that underlies the reservoir and extends to adjacent islands. The complex well system places pumps 160 ft. apart on the levees.  A seepage analysis model (plan view) was used to consider seepage conditions within the sand aquifer.  The model did not consider the influence of surface water infiltration from the proposed reservoirs or existing sloughs (URSGWC, 2000).  The DWP geotechnical consultants recommended that the interceptor wells extend to the bottom of the sand aquifer on Webb Tract and Bacon Island.

Because reservoir projects on peat islands do not exist, there is no data on seepage water DOC.  However, the DW Revised Draft EIR/EIS (Jones and Stokes, 2000) stated that "…a 9-month storage period with an assumed DOC concentration of 20 mg/l in the pumped seepage water results in an increased DOC loading estimate of 3 to 19 g/m$^2$/yr. This loading rate is relatively high compared to estimates of DOC loading under existing agricultural practices, which include a considerable amount of drainage to balance seepage from adjacent channels and maintain acceptable water levels for crop production".

The impact of returning seepage water with an assumed 20 mg/l DOC concentration, as described by the DW revised EIR, could add about 1 mg/l DOC to reservoir DOC concentrations.  This concentration of DOC would be additive to that resulting from peat soil and biological organic carbon loads. Due to the lack of data from similar reservoir projects on peat soil. There is a high degree of uncertainty in predicting the increase of DOC from the planned return of seepage water back on to the proposed reservoir islands. However, the potential water quality impacts of the seepage return water may be significant and must be included in the assessment of the water quality-related risk and reliability of the project, its yield, and its ability to operate under the terms of the Water Quality Management Plan.

### 3.3. Information Needs

The differences between the magnitude of water quality changes seen in the SMARTS experiments and a reservoir Delta island would be expected from variations in the amounts of soil organic carbon, water depths, and carbon production by plants and algae.  The significance of wetland plants and phytoplankton in the reservoir islands as

organic carbon sources has not been adequately addressed for water quality modeling purposes.
The major organic carbon source during the winter filling months will be from peat soil leaching and decay. As water temperatures and available sunlight increase, organic carbon production from photosynthetic plants and algae become new sources. Long-term experiments are needed to develop mathematical relationships for this component of the model.

There are no data to determine if groundwater returned to the reservoir islands by the many proposed seepage wells placed along the levees of Bacon Island and Webb Tract could degrade the water quality of the stored water. TOC concentrations of domestic wells were low (1 mg/l), but seepage water quality under the proposed reservoir conditions (21 ft. water depth and hydraulic head pressure) may result in higher organic carbon concentrations over time.

The SMARTS experiments provided logistics curves for modeling DOC from peat soil release and microbial decay. The logistic equations can provide rough estimates of the maximum DOC concentration in the reservoir water that is reached during storage. Different curves resulted from different maximum DOC concentrations of each tank which, in part, could be attributed to different soil organic matter conditions (low or high organic carbon) at startup or environmental conditions within the tank that affected microbial activity (e.g., growth, species, metabolism).

Currently, data to develop these equations are severely limited without any replication to quantify variability. More experiments could provide logistics equations for each soil type and condition of the islands. However, such experiments are time consuming and expensive. Other methods need to be explored to relate the potential of different types of organic soil in releasing organic carbon under flooded conditions and operations of the DWP.

The effects of wet and dry cycles on DOC availability in subsequent inundations have not been studied. Such experiments are needed to assess repeated filling and emptying of the project.

Other studies should examine methods that might reduce organic carbon releases from flooded peat soil. These methods might include tilling of fields in the summer to increase microbial breakdown of organic matter and draining the fields prior to filling. Some of these studies can be performed at DWR's SMARTS facility and laboratory.

### 3.4. References


Coughlin, R.F. and D.E. Zitarelli. 1989. Calculus with Applications. Saunders College Publishing.

Fair, G.M., J.C. Geyer, and D.A. Okun. 1958. Water and Wastewater Engineering. Volume 1. Water Supply and Wastewater Removal. Jon Wiley & Sons, New York.

Forkel, D. 2001. Email from David Forkel of Delta Wetlands to Paul Hutton, Department of Water Resources, on seepage interceptor wells. 3/9/2001.

Jung, M. 2001. Synthesis of Data for Development of Reservoir Island Organic Carbon Model for DSM2 Model. Technical Report for Department of Water Resources Delta Modeling Section. Marvin Jung & Associates, Inc., Sacramento, CA. November 2001.

Jung, M. and L. Weisser. 1999. A trial experiment on studying short-term water quality changes in flooded peat soil environments. Report for California Urban Water Agencies and Municipal Water Quality Investigations Program of the Department of Water Resources. Marvin Jung & Associates, Inc., Sacramento, CA. July 1999.

Jung, M. and L. Weisser. 2000. Final report on experiment #2: Seasonal water quality changes in flooded peat soil environments due to peat soil, water depth, and water exchange rate. Study conducted and funded by the Municipal Water Quality Investigations Program Division of Planning and Local Assistance California Department of Water Resources. Marvin Jung and Associates, Inc., Sacramento, CA. December 2000.

Jones and Stokes. 2000. Delta Wetlands Revised Draft EIR/EIS. Appendix G. Water Quality Assessment Methods. May 2000.

Lial, M.L., C.D. Miller, and R.N. Greenwell. 1993. Calculus with Applications, Brief Version. Fifth Edition. Harper Collins College Publishers.

Reddy, K.R., R.Khaleel, and M.R. Overcash. 1980. Carbon transformation in the land areas receiving organic wastes in relation to nonpoint source pollution: A conceptual model. J. Environ. Qual. 9:434-442.

URS Grenier Woodward Clyde. 2000. Levee stability and seepage analysis report for the Delta Wetlands Project Revised EIR/EIS. Supplemental geotechnical report. May 22, 2000.

## Chapter 4 Water Quality Biological Productivity Studies

### 4.1 Introduction

Organic carbon loading of water stored on the reservoir islands of the DW Project, Bacon Island and Webb Tract and Victoria Island, the alternative reservoir island, has been identified as a water quality variable of concern because it increases the concentration of disinfectant by-products, such as trihalomethanes and haloacetic acids in treated drinking water. Three sources of organic carbon loading have been identified as major components that need to be addressed in the DW Project water quality model, they are: 1) seepage return water, 2) peat soil and 3) photosynthetically produced organic carbon from algae and aquatic plant growth (Jung 2001). Ecological Research associates (ERA) have been asked to provide estimates of photosynthetic production and subsequent release of total organic carbon from the Delta Wetland Project reservoir islands. Specifically our tasks have been identified as:

4. Identify key parameters affecting plant growth and degradation on the islands.
5. Develop tractable groupings of plants that can be related to conditions on the islands and develop algorithms to describe plant growth.
6. Analyze fate of organic carbon fixed on the islands during plant growth and develop algorithms to describe degradation and release of organic carbon to the Delta channels.
7. Examine carryover affects from fill to fill and develop method of accounting for this in the modeling.
8. Write a report to transmit algorithms to the In-Delta Storage Water Quality Evaluation group, and which discusses the study findings including caveats and limitations.

A summary of organic carbon loading estimates is provided in Table 2 at the end of this reports.

The effects of hydrology on freshwater productivity and decomposition are not clear and it cannot be assumed that changes in the frequency or duration of flooding will necessarily increase or decrease organic carbon accumulation or export (Mitsch and Gosselink 1993). This is the current state of wetland ecology despite extensive study of many wetland systems. Predicting carbon budgets for systems that have not yet been created has an additional layer of uncertainty. Nevertheless, it is often necessary to consider complex ecological questions in advance of the implementation of large projects expected to have environmental impacts. Proper and thorough answers to complex environmental questions require orchestrated team efforts combining researchers with a diversity of backgrounds in historic analysis, hydrodynamic modeling, and both laboratory and field experiments (Cloern 2000).

A proper and thorough consideration of the five aforementioned tasks would require a large commitment of resources and time, much larger and longer than what is currently available for this isolated ERA contribution. Of the three sources of organic carbon loading identified in the first paragraph, the algal and aquatic plant component is arguably more complex and potentially of greater magnitude than either the peat soil or seepage water components. Nevertheless, we have been asked to address these complex ecological questions within a very short one to two month deadline. A thorough consideration of the role of algae and aquatic vascular plants in organic carbon loading on these reservoir islands should include an extensive literature review and rigorous experimentation. The draft EIRs for this project go back to 1990 and contain thousands of pages of background information. It would easily take the majority of our available time just to review the EIRs. Additionally, there is not enough time for experimentation. For comparison, two years of experimentation and a new research facility, the Special Multipurpose Applied Research Technology Station built in 1998, have been used to complete similar tasks for the peat soil component. With the limited amount of time and resources available to us to address these complex ecological questions, we think that it is important to mention that we are limited in what we can say about photosynthetic production and subsequent release of total organic carbon from these islands. The estimates presented in this report are the best that we can provide but may be subject to error.

## 4.2 Methodology

In order to address organic carbon loading from algal and aquatic plant growth, some assumptions were necessary. This report is based on the following assumptions.

- The maximum monthly rate of diversion will not exceed 4,000 cubic feet per second (cfs).
- The maximum monthly rate of discharge will not exceed 4,000 cfs.
- When the reservoirs are full, the maximum water depth is 20 feet, which is four feet above mean sea level.
- The reservoir bottoms are essentially flat.
- The combined storage capacity of Bacon Island and Webb Tract is 215,629 acre feet (DWR 2001).
- It would take approximately three months to fill the empty reservoirs.
- It would take approximately three months to drawdown the full reservoirs.
- It is unlikely that multiple fillings and drawdowns would occur in one year.
- The minimum rate of diversion and discharge could be zero or effectively zero if, for example, water is unavailable for diversion in dry years or if water quality problems prohibit discharge in wet years, respectively.
- Once initially filled, it is assumed that reservoir islands will not dry out because of recommended management actions directed at avoiding repeated wet and dry periods on the peat soils (Jung and Weisser 2000) and seepage return.
- The reservoir islands function as shallow, flat-bottomed lakes with three possible fill and drain cycles or scenarios.

Hydrology, or diversion/discharge cycles are important factors that will influence the quality and quantity of photosynthetic production. Three possible diversion/discharge scenarios were used to asses productivity.

### 4.2.1 Diversion/Discharge Scenarios

Scenario One represents continuous full storage, minimum discharge.

*Year-round* full storage with 20 feet maximum and mean depth

Scenario Two represents desired storage operations, i.e. reservoirs filled in winter and emptied in summer.

*December through February*– reservoirs filled, start at 2 feet deep and fill to 20 feet deep.
*March through May*– storage period at 20 feet deep
*June through August*– reservoirs drained, start at 20 feet deep and drain to 2 feet deep
*September through November*– empty period at 2 feet deep

Scenario Three represents continuous non-storage, empty, minimum diversion.

*Year-round s*tanding water, two feet deep or less, soil remains wet

All three scenarios are based on Appendix G2 in the 1995 Draft EIR/EIS with consideration of additional information such as a maximum water depth not to exceed four feet above mean sea level from DWR description of alternatives and land surface below sea level from the Delta Atlas.

## 4.3 Algae and Vascular Aquatic Plant Growth

Photosynthetic production, i.e. productivity rates and standing biomass, and the subsequent release of total organic carbon are likely to be highly variable among the three aforementioned scenarios for the reservoir islands. It's important to expect variability in what types of plants, including algae, grow on these reservoir islands. This variability could result in net export or accumulation of organic carbon. More importantly for water quality concerns, there is the potential for extensive aquatic plant growth on these islands to produce an additional load of dissolved organic carbon similar to, or in excess of, that expected from inundation of the peat soils. Additionally, the long term importance of photosynthetic production to dissolved organic carbon might increase relative to the importance of the peat soils. This increase might occur during the first few years of these islands being changed from agricultural systems to aquatic systems when aquatic plant biomass and productivity will probably increase. At the same time, the repeated filling and emptying of the islands is expected to leach out soluble organic matter from the peat soils and cause a long term decline in dissolved organic carbon loading from the peat soils (Jones and Stokes, 2000). However, there is a large reservoir of organic carbon in the peat soils and the rate of conversion of soil POC to soil DOC might be similar to the leaching rate and result in substantial loading for a long time. The following sections will discuss the potential for algae and macrophyte production and decay under the three fill-and-drain cycles, or scenarios.

### 4.3.1 Scenario One, full storage and minimum discharge

Scenario One is likely to produce a condition on the reservoir islands where phytoplankton are the dominant source of photosynthetic production, at least initially. The key parameters affecting phytoplankton growth should include light attenuation in the water column and temperature. The attenuation of light will be affected by the quantity and quality of the total suspended sediments in the Delta channel water used to fill the reservoirs are also important parameters because they affect how light will be attenuated, scattered and absorbed. Decades of agricultural activity have probably loaded the soils with nutrients from fertilizers and delta water has high levels of nitrogen and phosphorus so that nutrient limitation of the phytoplankton is unlikely. The optical model described below, which accounts for particle sedimentation and resuspension due to water mixing on the reservoir islands, provides a description of plant growth and a way to estimate the quantity of phytoplankton biomass that might be produced on the reservoir islands. Maximum phytoplankton biomass will probably develop in mid to late summer as water temperatures increase and reach their maximum.

#### 4.3.1.1 Light Attenuation and Mixing

Light attenuation by water constituents will have a critical role in determining the amount of organic carbon within the reservoir; it will almost certainly be the limiting resource for primary production (Cloern 1999). Irradiance E at a depth z is given by

$$E(z) = E(0)\exp(-K_d z) \qquad \text{[Equation 1]}$$

Where E(0) is the irradiance at the surface. The irradiance attenuation coefficient for photosynthetically available radiation (PAR), $K_d$(PAR), will be most strongly affected by the concentrations of suspended sediment, algae, and colored dissolved organic matter (CDOM). CDOM or dissolved organic matter (DOM) is effectively the same thing DOC in terms of this light attenuation discussion. $K_d$ can be modeled as a sum of attenuant concentrations multiplied by their respective attenuation cross-sections:

$$K_d = K_{sed}C_{sed} + K_{algae}C_{algae} + K_{CDOM}C_{CDOM}$$

The cross sections are in units of $m^2\ g^{-1}$ which, when multiplied by concentration in $g\ m^{-3}$, yields attenuation in units of $m^{-1}$.

Attenuation cross-section of mineral suspensoids range from 0.025 to 1.1 $m^2\ g^{-1}$ (Davies-Colley et al. 1993). This value corresponds well to regressions of Interagency Ecological Program (IEP) Delta data in the range of turbidities expected in the reservoir islands; over all the available data, including very high TSS concentrations (total suspended solids mg $L^{-1}$) that are unlikely in this setting, the coefficient for $K_d$(PAR) vs TSS is 0.10 $m^2\ g^{-1}$.

The regression analysis of the IEP data shows that TSS explains almost 86% of the variability in $K_d$. The remaining variation is believed to be due to differences in particle size distribution within the suspended sediment, and variations in DOM, phytoplankton, and detritus concentrations. In the presence of resuspension, we can expect the turbidity to remain relatively constant.

The likelihood of sediment resuspension can be estimated given wind conditions and knowledge of the basin dimensions. Given the expected size and depth of these reservoirs, wind-driven waves can be expected to exist in the shallow water regime in which wave motion extends to the bottom (Pond and Pickard 1983). Wind-driven water motion will penetrate through whatever stratification might exist, and is likely to be the dominant source of resuspension, mixing, and transport. The mean drift current, caused by the wind, is likely to be 2-3% of the mean wind speed (Bailey & Hamilton 1997, and references therein), or 0.26 mph. At this speed, resuspended sediment would be distributed throughout the reservoir island in less than one day

Using hourly wind data for Antioch in 1997 (Ceres web site) and the approach presented in Booth et al. (2000), likelihood of sediment resuspension and wind mixing (and therefore strong light attenuation) is presented in Figure 4-1.

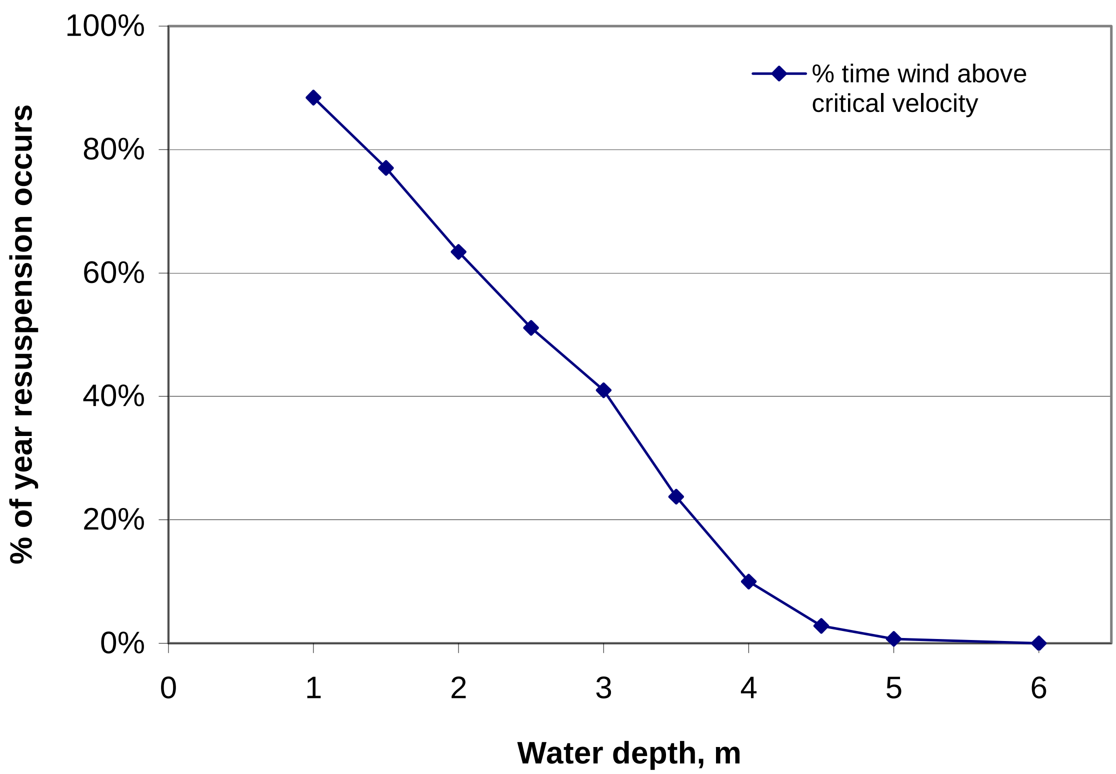



Figure 4-1. Percentage of time, on an annual basis, during which sediment is likely to be resuspended, as a function of water depth.

If the reservoir is completely filled to 6 m depth, normal wind waves are unlikely to cause major sediment resuspension. However, as water level drops to 4 m, resuspension can be expected roughly 10% of the year, increasing approximately linearly to 90% of the year at a water depth of 1 m. Since fine sediment can be expected to resettle very slowly, even infrequent resuspension events are likely to keep the water relatively turbid, as casual observation would confirm.

The mean annual prediction does not reflect the fact that the greatest wind energies are usually in the period April through September. Taking this and water depth into account, Figure 4-2 shows the predicted percentage of time sediment is likely to be resuspended. This relationship can be convolved with the filling, storage, and draining models to further predict sediment resuspension during filling and draining.

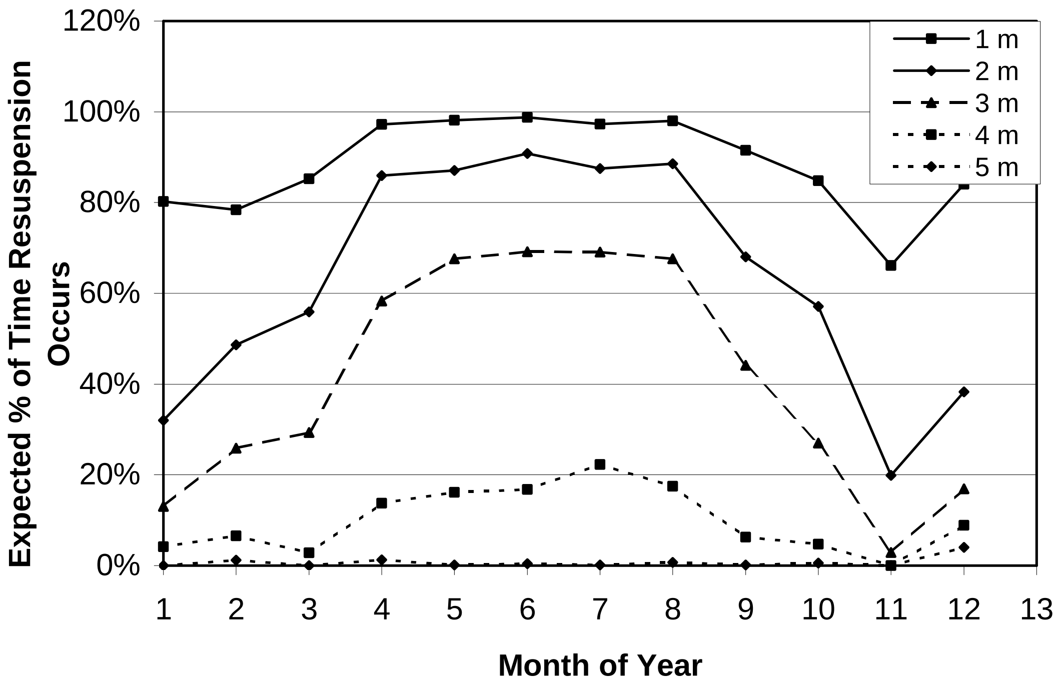



Figure 4-2. Timeline of likely sediment resuspension versus time and water depth. Note that water is likely to be stored during March through May (3-5) and discharged during June through August (6-8).

Carder et al. (1989), found that the absorption cross-section of DOM varied depending on the ratio of fulvic to humic acid content, but that generally a value of 0.13 $m^2g^{-1}$ was representative. Depending on the relative concentrations of DOM, sediment and algae, DOM could contribute significantly to PAR attenuation when sediment concentrations are low. Linear regression of the IEP data suggest that for zero TSS, $K_d$(PAR) = 2.2 $m^{-1}$. Due to the non-normal distribution of data, $K_d$(PAR) due to DOM is almost certainly closer to 0.9 $m^{-1}$. However, inorganic sediment may remain the dominant form of suspended particulate matter (Cloern 1987), and studies have shown that including algae in regression analyses does not improve the estimation.

As an example, if we assume the following values:

$$DOM = 7 \text{ mg L}^{-1,}, TSS = 20 \text{ mg L}^{-1}, \text{ then } K_d(PAR) = 2.91 \text{ m}^{-1}$$

To calculate the compensation depth of 1% surface irradiance, or the depth to which macrophytes may be expected to grow (Vant et al., 1986), we rearrange [Equation 1]:

$$z = -Ln[E(z)/E(0)] / K_d$$

$$z(1\%) = -Ln[0.01] / 2.91 = 1.58 \text{ m}$$

Particle settling will depend heavily on whether the reservoirs become thermally stratified, energy inputs for mixing (e.g., wind), whether the bottom becomes covered with macrophytes, and the cohesiveness of the sediments. While water bodies >6 m (20 feet) in depth are often sufficiently deep to stratify (Wetzel 2001), these reservoirs have very large surface areas, flat bottoms, and exposure to Delta winds, and may not stratify. If not, particle resuspension will likely maintain relatively turbid conditions. Larger sediment particles (>63 µm) will tend to settle out relatively rapidly, but the fraction consisting of silts and clays <63 µm will tend to stay in suspension almost indefinitely (Eisma 1993), and it is the small size fraction that contributes most strongly to light attenuation (Davies-Colley et al. 1993).

The minimum TSS concentration observed in the IEP data was 2 mg $L^{-1}$, which, with a DOM concentration of 7 mg $L^{-1}$, implies a photic depth of ~ 4 m.

Suspended sediment in the Delta consists almost entirely of very small particles. The table below presents a summary of particle size distribution (PSD) of a range of Delta samples (Swift, July 2000 unpublished data).

| | Frank's Tract | Rio Vista |
|---|---|---|
| Mean dia, µm: | 19.0 | 30.8 |
| Median dia, µm: | 14.3 | 20.3 |
| 10%< dia: | 4.0 | 5.0 |
| 50% < dia: | 14.3 | 20.3 |
| 90% < dia: | 39.7 | 63.0 |

Water column primary production from phytoplankton can be predicted from a theoretical basis and certain reasonable assumptions. Under the assumptions that primary productivity is proportional to light absorbed by photosynthetic pigments; PAR light attenuation does not change with depth; chlorophyll a is vertically homogeneous; and water column depth exceeds photic zone depth.
derived:

$$P_g = \Psi B I_o\, z_p = 4.61 \Psi B I_o / K_d$$

where $P_g$ (mg $m^{-2}$ $d^{-1}$ C) is gross primary productivity in the water column; $\Psi$ (mg C [mg Chl]$^{-1}$ [E $m^{-2}$ ]$^{-1}$) is an efficiency factor; B (µg $L^{-1}$ ) is chlorophyll-a concentration; $I_o$ (E $m^{-2}$ $d^{-1}$) is surface PAR; $z_p$ (m) is photic zone depth, i.e., the depth to which 1% of surface PAR penetrates; and k ($m^{-1}$) is the vertical attenuation coefficient for PAR.

This equation has since been verified in many different aquatic ecosystems throughout the world (Platt 1986, Platt et al. 1988), including San Francisco Bay (Cole and Cloern 1984, Cole et al. 1986) and other estuaries (Cole and Cloern 1987, Heip et al. 1995, Kromkamp et al. 1995), when $\Psi$ is calibrated for local conditions. A value of $\Psi$ estimated from data within the Delta was 0.728 ± 0.023 mg C [mg Chl]$^{-1}$ [E $m^{-2}$ ]$^{-1}$ ($R^2$ = 0.952, p = 0.000, n = 51).

Wetzel (2001) provides a range of phytoplankton primary productivity of 369 to 640 g C $m^{-2}$ $yr^{-1}$ in eutrophic lakes and a mean of 737 g C $m^{-2}$ $yr^{-1}$ for 21 eutrophic reservoirs. Alpine and Cloern (1992) reported that mean phytoplankton primary production was 106 g C $m^{-2}$ $yr^{-1}$ before *Potamocorbula* invasion, and 39 g C $m^{-2}$ $yr^{-1}$ when *Potamocorbula* were abundant. They also reported that, as one might expect, biomass was higher at low flow rates and long residence times. Predicting carbon export however, is more difficult than predicting primary production or biomass (Mitsch and Gosselink 1993). A significant portion of phytoplankton production is rapidly turned over. Export of organic carbon by rivers has been estimated at 1% of net primary productivity in a watershed however TOC and DOC concentrations show no consistent trend with productivity and interactions between terrestrial and aquatic systems and the influence of decomposition further complicate matters (Ford 1993). Even if we could accurately predict primary productivity rates and standing biomass, estimating degradation and export of carbon from these reservoirs is complicated because the fate of phytoplankton and the corresponding carbon fixed by phytoplankton is not simply a function of hydrology. Fixed carbon can be held in biomass or mineralized and released as $CO_2$. Phytoplankton can die and be decomposed by bacteria, be eaten by zooplankton, or sink and be incorporated into the sediment only to be later redistributed as organic or inorganic carbon. Phytoplankton can also release some of the fixed carbon before or after the organic carbon has been metabolized (Wetzel 2001).

In order to analyze the fate of organic carbon fixed on the islands during plant growth and develop algorithms that describe degradation and release of organic carbon to the Delta channels we need to know much more than the expected hydrologic cycle of these reservoirs. The possible interactions among abiotic factors such as: the hydrologic cycle, temperature, light and nutrients, and biotic factors such as: phytoplankton diversity, macrophytes coverage, zooplankton community structure and the incredibly diverse and elusive microbial component provide an effectively infinite number of possibilities. This is why rigorous experimentation is necessary to adequately address questions of photosynthetic production and subsequent release of total organic carbon from the Delta Wetland Project reservoir islands.

Despite these complexities, one way to start thinking about the question of how much phytoplankton will affect organic carbon loading on the reservoir islands is to consider worst case and best case situations. Chlorophyll *a* constitutes about 0.3% to 3% of total phytoplankton dry weight (d.w.) (Lee 1989). If chlorophyll *a* is on average 1.5% of the d.w. of organic matter, multiplying the chlorophyll *a* concentration by 67 (1/0.015) can be used to estimate d.w. algal biomass (APHA 1980). This is a way to estimate total algal d.w. biomass, not organic carbon d.w., from chlorophyll concentrations in the water. In order to estimate organic carbon from chlorophyll, it might be better to multiply the chlorophyll *a* concentration by 43 instead of 67. Here's why. Water accounts for about 90% of the fresh weight or wet weight of a cell (Madigan et al. 1997) and the average organic carbon content of algae is approximately 6.5% of fresh weight (Wetzel 2001). Therefore, the d.w. organic carbon content of algal biomass should be about 65% of the total d.w. algal biomass (65% of 67 is 43).

Reasonable estimates for chlorophyll *a* concentrations in a eutrophic lake or reservoir could be 10 mg $m^{-3}$ for a best case and 275 mg $m^{-3}$ for a worst case based on Wetzel (2001). Typical values in the Delta channels are in the lower portion of this range- 10 to 30 mg $m^{-3}$. Assuming a worst case situation as the occurrence of an algal bloom (a chlorophyll *a* concentration of 275 mg $m^{-3}$) at the same time as the discharge of a reservoir island, TOC loading to the water in the reservoir from phytoplankton could be 12 mg $L^{-1}$. Thus, phytoplankton carbon loading could be similar to that from the peat soils, based on Jung's (2001) estimate of 12.8 mg $L^{-1}$. Assuming the best case situation of low phytoplankton biomass (a chlorophyll *a* concentration of 10 mg $m^{-3}$), TOC loading to the water in the reservoir from phytoplankton could be about 0.4 mg $L^{-1}$. Because particles will settle and turbidity will decrease when channel water is put on the islands, it seems reasonable to expect that in a light-limited, phytoplankton dominated situation, a worst case scenario would be above the 30 mg $m^{-3}$ concentration seen in the Delta channels. However, wind mixing and resuspension must be considered. Therefore, the 275 mg $m^{-3}$ chlorophyll concentration seems unlikely, especially for the entire water column, and a concentration between 30 and 275 mg $m^{-3}$, such as 150 mg $m^{-3}$ seems more reasonable. In addition, a worst case chlorophyll concentration of 150 mg $m^{-3}$ is consistent with the highest average concentration observed in SMARTS (Special Multipurpose Applied Research Technology Station) Experiment 1 (tank three). A chlorophyll concentration 150 mg $m^{-3}$ would result in organic carbon loading of 6.5 mg $L^{-1}$, which is also consistent with TOC and DOC data from SMARTS Experiment 1. The average difference between TOC and DOC concentrations in tank three was about 10 mg $L^{-1}$, and on the order of what should be expected from phytoplankton POC loading based on the average chlorophyll *a* concentration at about 150 mg $m^{-3}$ (150 mg $m^{-3}$ * 43 = 6.5 mg C $L^{-1}$). The 150 mg $m^{-3}$ chlorophyll concentration suggests that organic carbon loading from phytoplankton might be similar but less than organic carbon loading from the peat soil. However, the results from tank three were in two feet of water. As the depth increases and dilutes the effect of the peat soil, the relative role of phytoplankton is likely to increase, especially if the reservoirs remain well mixed and a bloom concentration of phytoplankton is found throughout much of the water column.

Phytoplankton can also release dissolved organic carbon but in healthy actively growing phytoplankton the amount is usually low at about 1% to 5% of photosynthetically fixed carbon (Wetzel 2001). Conditions of stress, such as light limitation, can cause phytoplankton to significantly increase the release of DOC but the amount is usually less than 20% of the photosynthetically fixed carbon (Wetzel 2001). Depending on the dominant species of phytoplankton, a reasonable range for the particle size diameter is 1 to 100 μm. Thus, most of the carbon loading from phytoplankton would be in the form of 1 to 100 μm POC rather than DOC as it leaves the island. However, we know that much of the organic carbon loading to shallow aquatic systems is as DOC from wetland sources, therefore phytoplankton may not be a large source of organic carbon loading relative to submersed and emergent macrophytes (Wetzel and Sondergaard 1998). This suggests that phytoplankton may not be a dominant source of organic carbon loading in these reservoirs. Bacterial production of organic carbon is correlated with algal production and can also increase organic carbon loading, on average by about 20 % of algal primary productivity (Ford 1993).

### 4.3.2 Scenario Two, desired storage operations, reservoirs filled in winter and emptied in summer

Scenario Two represents a situation where phytoplankton would likely dominate the reservoir initially, but in three to five years, the reservoir would probably shift to a more submersed macrophyte dominated system. Similar to phytoplankton, submersed macrophytes would be limited primarily by the key parameters of temperature and light. Scenario Two could also develop a significant emergent plant component, especially if the reservoirs are rapidly drained and shallow water or saturated soil conditions exist for a few months in late summer and early fall. For example, if the reservoir is drained by July and remains covered with shallow water or saturated soil through October, substantial emergent macrophyte growth could develop. Three to five months is sufficient time to produce a large biomass of submersed aquatic plants or emergent plant especially after one or two years of recruitment and the development of a large propagule bank (similar to a seed bank in terrestrial soils but more concerned with vegetative propagules).

Tall, aggressive and rapidly growing submersed macrophytes are often dominant in shallow lakes but can coexist with phytoplankton under eutrophic, high nutrient conditions (Wetzel 2001). Submersed plants can colonize a substrate down to the compensation depth, which is the depth where the available light is about 1% of the average light at the surface of the water (Sculthorpe 1967, Vant et al 1986). The optical model suggests that this compensation depth is well above the bottom of the reservoir islands when they are full at 20 feet deep. Hence, as long as the water remains turbid and deep, submersed aquatic plants should have difficulty colonizing the islands. However, as the reservoirs are eventually drained, enough light will become available for submersed aquatic plants to colonize the substrate.

Once submersed plants get started in the nutrient rich peat substrate, they will probably grow rapidly. In just a few months of growth, these plants can store carbohydrate reserves in stem and root tissue. Then at the start of the next growing season, they can utilize these reserves to grow, without light, and reach above the compensation depth, even if the water depth returns to the maximum 20 feet. While water depths around 20 feet may not be optimal for submersed aquatic plant growth, these depths will not necessarily prohibit the growth of species commonly found in the Delta. Smith and Barko (1990) report that *Myriophyllum spicatum* is typically most abundant in water 1 to 4 m deep (about 3 to 13 feet), it can be found in water up to 10 m deep (about 33 feet).

Given the 38 proposed recreational facilities with boat docks and immediate proximity of these reservoirs to waters already heavily infested with invasive weed species, it is likely that wildlife or human activity will transport fragments to the reservoir islands. Unfortunately, screening intake siphons and educating people that might intentionally or unintentionally transport plant material to the reservoirs, while good ideas, would probably only reduce the speed at which invasive species become established. The abundance of submersed aquatic vegetation in the waters that will be diverted to these reservoirs must also be considered in the design of intake siphon screens so that they don't plug or fail to screen out fish and weed fragments. A more novel approach to combating invasive species that could be considered is the establishment of native species and aggressive monitoring and management of invasive recruits. The successful establishment of natives will require careful selection of species based on knowledge of the fill and drain cycle and an ability to manage that cycle for plant species or have a predictable and consistent cycle. A variable year to year fill and drain cycle will keep the reservoir system in a disturbed state and will probably favor opportunistic, invasive species.

Rooted macrophytes will tend to stabilize the bottom sediments, reducing wind-driven sediment resuspension. Macrophyte roots and stems will also create a sheltered boundary layer that may increase the rate of sedimentation. These mechanisms will tend to create a positive feedback between water clarity and macrophyte growth: More macrophyte growth will increase sedimentation, which will increase water clarity, which will increase macrophyte growth. When and how quickly this happens will depend very sensitively on the managed water depth, turbidity, and mixing processes.

In Scenario Two, a worst case situation might be the development of a dense stand of submersed macrophtyes effectively covering the entire bottom of the reservoir, and the rapid death and decay of the plants making all of the organic carbon available for export. The submersed aquatic plant species that are likely to establish in the reservoir islands in clude: *Egeria densa, Myriophyllum spicatum, Potamogeto crispus, Potamogeton pectinatus, Potamogeton nodosus, Ceratophyllum demersum, Cabomba caroliniana*. It should be pointed out that submersed aquatic vegetation provides a massively diverse three-dimensional substrate for attached microbial communities and that epiphytic algae may be more important than the submersed macrophytes in terms of productivity of the ecosystem (Wetzel and Sondergaard 1998).

Regardless of the complex ecological interactions between microbial communities and submersed macrophytes, it is important to point out that these reservoir islands have the potential to be highly productive systems. Conditions that develop in the reservoir islands will probably be similar to those in Delta waters adjacent to the reservoir islands, such as Frank's Tract, Sandmound Slough and Seven Mile Slough. Published data on the standing biomass of submersed vegetation vary widely because of inconsistencies in excluding or including underground organs, epiphytic algae and inorganic matter. However a reasonable range for estimates of submersed macrophyte biomass for species such as *Ceratophyllum demersum, Potamogeton pectinatus* is about 100 g d.w. $m^{-2}$ to 1000 g d.w. $m^{-2}$ (Sculthorpe 1967). In the spring and early summer of 1996, average biomass measurements made in Sandmound Slough and Seven Mile Slough were about, 1800 g d.w. $m^{-2}$ and 2100 g d.w. $m^{-2}$ respectively, and suggest that *Egeria densa* biomass in the Delta is at the upper end or above Sculthorpe's range (Anderson et al. 1996). The fresh or wet weight of an average submersed macrophyte is about 6.5% carbon and about 90% water, and the dry weight of an average cell is about 50% carbon (Wetzel 2001, Sculthorpe 1967, Madigan et al. 1997). Reasonable estimates of organic carbon loading from macrophytes on the reservoir islands could probably be derived from monitoring in reasonable detail: macrophyte productivity and biomass, TOC and DOC concentrations and the hydrologic factors in Frank's Tract, Sandmound Slough and Seven Mile Slough.

In August of 2001, ERA measured TOC and DOC in a lake that is geographically located in the northwestern part of the Delta but hyrologically separated from the Delta except that it overflows into the Delta during significant winter rain events. The lake is filled with well water, which is probably low in DOC, and has abundant submersed macrophyte growth with minimal phytoplankton. ERA also measure TOC and DOC in the lake water after it had overflowed from the lake and moved through a small, dried-cattail wetland. DOC and TOC concentrations in the lake were 6.0 and 6.6, respectively. DOC and TOC concentrations after the lake water had flowed through the small wetland increased to 7.2 and 8.3 mg $L^{-1}$, respectively.

Organic carbon loading from macrophytes can also be estimated by considering a worst case situation. High submersed plant biomass measurements that range from 1000 g d.w. $m^{-2}$ (Sculthorpe 1967) to an in-Delta estimate of 2100 g d.w. $m^{-2}$ (Anderson 1996). Assume a reservoir could have 1000 g d.w. $m^{-2}$ of submersed macrophytes and about half of the carbon in the plants were released as DOC if the plants suddenly die. DOC loading would be about 250 g $m^{-2}$ $yr^{-1}$. In a reservoir filled to 20 feet, the corresponding DOC concentration could be about 41 mg C $L^{-1}$. This estimate of organic carbon loading is far more than what was estimated from several experiments conducted for the DW Project (Appendix C3, 1995 EIR/EIS). The actual concentration of DOC in the discharge water would depend on interactions among timing, microbial activity and physical conditions. The important point is that submersed aquatic plants, like phytoplankton, might flourish on these reservoir islands and contribute to organic carbon loading on a scale equal to or greater than organic carbon loading from peat soils (Jung 2001). Also, organic carbon loading from phytoplankton or submersed aquatic plants would, for the most part, be in addition to the peat soil carbon loading. However, there could be some interaction between DOC from the peat soils and primary productivity, especially at higher levels. For example, DOC from the peat soils might color the water enough to substantially reduce primary productivity via increased light attenuation (Carpenter *et al.* 1998).

Photosynthetic production from submersed macrophytes and the subsequent release of total organic carbon could potentially be large and is likely to be highly variable on the reservoir islands. Making predictions is a difficult task because of complex interactions among submersed macrophytes, attached algae and phytoplankton. For example, the presence of epiphytic algae affects the amount of organic carbon released to the water from macrophytes by physically and metabolically separating the macrophytes from the surrounding water (Losee and Wetzel, 1993). Submersed macrophytes could facilitate a net negative organic carbon export, in other words, a reduction in organic carbon from other sources such as phytoplankton and peat soils, especially if water is discharged from the reservoir islands during or soon after rapid growth of submersed macrophytes and epiphytic microbiota. Attached algal productivity can exceed that of the submersed macrophytes and phytoplankton combined and DOC entering the macrophyte-epiphyte complex can be effectively scavenged (Wetzel and Sondergaard 1998).

#### 4.3.2.1 Carbon Transformations

The amount of organic carbon released from the system depends not only on the level of primary production, but also how the organic carbon can be transformed before it is discharged from the system. Of particular importance is the decay of the macrophytes because usually more materials are transferred through detrital pathways relative to grazing pathways (Mann 1998). There are several main stages in the decomposition of macrophyte plant material: (1) leaching of dissolved organic matter from dead material, (2) fragmentation of the material to particulate organic carbon (POC), and (3) utilization of the organic matter, largely by microbes. A summary of the breakdown of macrophyte litter is given in Figure 4-3.

The initial breakdown of the macrophyte litter can be rapid. In a study of a *Nymphoides peltata*, a floating-leaved macrophyte, only a minimal amount of litter was found to remain after samples were submersed in litter bags for 40 days (Brock 1994). Bastardo (1979) found breakdown rates for seven submerged aquatic plants shown in Table 4-1.

Whether macrophyte litter is initially broken down into POC or DOC varies with environmental conditions and species; however approximately 20-40% of the original biomass is released as DOC, although there is large variation that can probably be explained by plant composition (Brock 1994). Emergent macrophytes have more lignin than submerged and floating-leaved plants, and thus usually take longer to breakdown and decompose. Brock (1984) found that approximately 23-29% of the original plant biomass of a floating-leaf macrophyte, *Nymphoides peltata*, was transformed to DOC by physical leaching and autolysis within the initial period of decomposition.

Autolysis is the release of DOC from the deterioration of cellular membranes by the plants enzymes during plant senescence and death (Wetzel 2001). The leaching rate of the *N. peltata* seems comparable to rates for other species, such as ca. 19-20% for *Carex* litter (Federle and Vestal 1982), and ca. 13% for *Phragmites* leaves, an emergent macrophyte (Polunin 1982). Denward and Tranvik (1998) found approximately 40% of litter from an emergent macrophyte became DOC, whether it leached from litter or POC, within a 63 day sampling period. In a study of eelgrass (*Zostera marina*), Harrison and Mann (1975) found that an average of 65% of original dry weight is transformed to DOC.

**Figure 4-3.** Potential Fates of Macrophyte Detritus

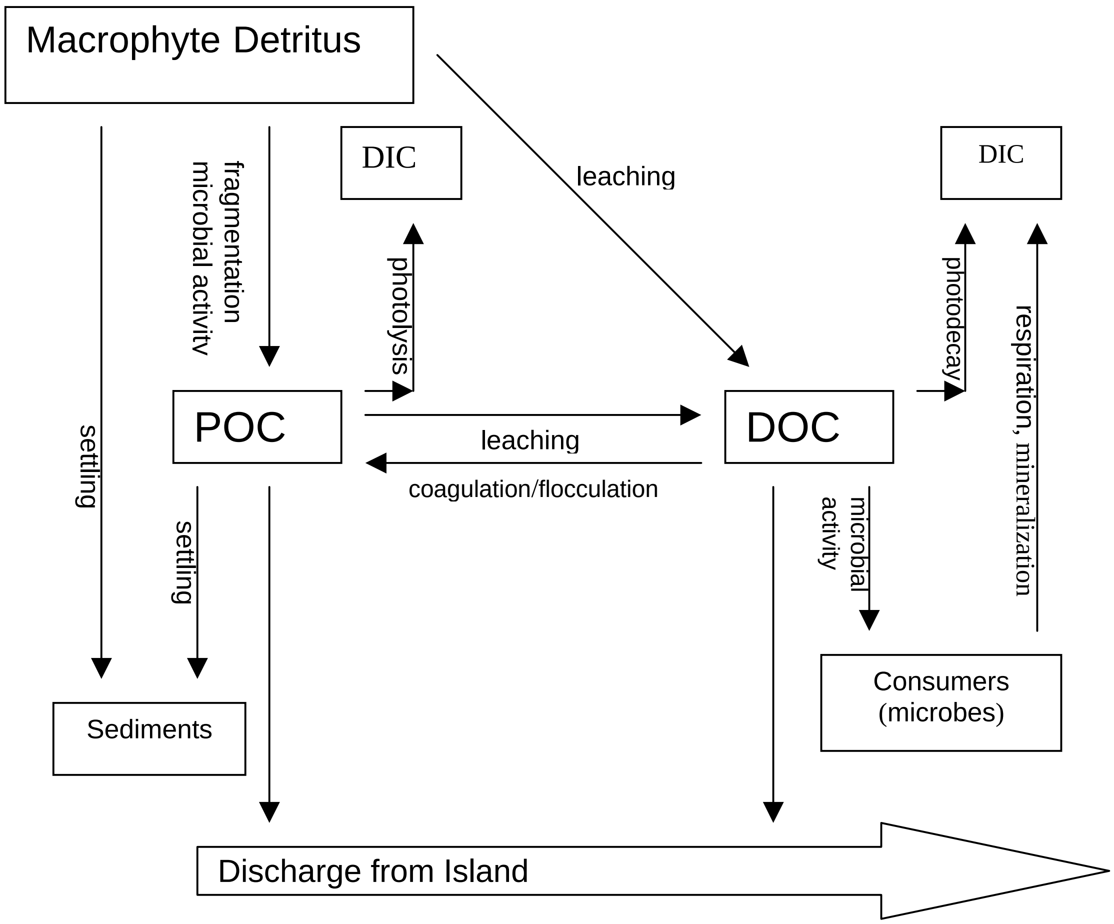



**Table 4-1:** Disappearance of seven submerged macrophyte species when placed in lake water in the dark. Percents are of dry mass lost. The rates of organic matter loss are slightly higher. (Taken from Bastardo 1979)

| Species | time of 50% loss (days) | Time of 95% loss (days) |
|---|---|---|
| *Chara* sp. | 82.6 | 370.1 |
| Fontinalis antipyretica | 50.2 | 205.4 |
| *Ceratophyllum demersum* | 32.5 | 152.3 |
| *Myriophyllum spicatum* | 22.0 | 111.8 |
| *Potamogeton lucens* | 13.2 | 57.2 |
| *Potamogeton perfoliatus* | 12.9 | 59.0 |
| *Elodea Canadensis* | 7.6 | 47.4 |

The DOC-POC breakdown also may vary with season, largely due to temperature. Brock (1984) found that at 20ºC, more fine POM was produced at the beginning of decomposition compared to at 8ºC; and at the end of a 46-day sampling period, more DOC was formed comparatively. In the reservoir islands, decomposition is expected at temperatures more similar to 20ºC. Additional DOC can be released from living plant material, depending on factors such as nutrient supply and light conditions (Mann 1998). While secretion rates of DOC can vary between 0.05 to 100% of photosynthetically fixed carbon, most field estimates have been between 1-10% fixed carbon with maximums occurring during the lowest rates of photosynthesis (Wetzel 2001).

Whether macrophyte litter breakdowns into POC or DOC affects the possible fate of the organic carbon. The possible fates of the POC not initially in the dissolved form will be discussed first followed by a discussion of the possible fates of DOC. POC can be transformed by the following pathways: 1) settling and being incorporated into the sediments, 2) photooxidation to produce inorganic carbon, 3) leaching into DOC, or 4) discharged from the system. In aquatic systems, the transformation of POC to other trophic levels through grazing is unusual (Mann 1998) and will be assumed insignificant to the transformation of POC in the reservoir islands.

The settling and incorporation of organic matter into the sediments can be significant depending on whether the macrophyte is still in larger pieces of litter or as smaller POC. The larger the particle, the more likely it will settle out because of faster sinking rates. Factors such as the water depth and lake mixing will also affect how much organic matter is lost to the sediments. These reservoir islands will probably be well mixed by the wind. Once the POC or litter enters the sediments, which are likely to be anoxic in the reservoir island if they are permanently flooded, the decomposition of the litter and POC will be significantly slower and the organic carbon may be stored in the system. As we mentioned, the islands could act as carbon sinks or sources, or both, depending on many complex and interacting factors.

POC can be decomposed directly into inorganic carbon by photooxidation. This process can be significant in the transformation of small POC as well as larger pieces of macrophyte litter. The extent of photooxidation can be greatly affected by intensity of photosynthetic active radiation (PAR, 400 to 700 nm waveband), UV-A, and UV-B radiation. Macrophyte species are affected to different degrees, probably partially due to factors such as surface area (Anesio et al. 1999). In a study by Anesio et al. (1999), the extent of photooxidation on four different emergent macrophytes was observed when exposed to full spectrum light. They found that the photooxidation of POC to inorganic carbon progressed linearly with time for at least the first 72 hours of exposure. The samples were exposed to the full light spectrum in the field with intensities of 7722 kJ $m^{-2}$ in the PAR range, 585 kJ $m^{-2}$ in the UV-A range, and 7 kJ $m^{-2}$ in the UV-B range. With these light intensities, they observed rates of POC to inorganic carbon transformation of up to 0.055 µg C $mg^{-1}$ dry-mass $h^{-1}$. Much of the photooxidation was thought to be due to light in the PAR range (72%) that can penetrate to greater depths than UV light. This transformation pathway is of significance to the carbon budget because it represents a loss of organic carbon.

When aquatic macrophytes begin to senescence or die, DOC is quickly leached out of the plant material. Exposure to UV light can roughly double the amount of DOC leached from plant litter and POC according to a study by Denward and Tranvik (1998). In their study, about twice as much DOC was produced in *Phragmites australis* decayed under PAR, UV-A, and UV-B light than samples decayed in the shade. At the end of the 63-day testing period, approximately 40% of the litter's carbon had been transformed to DOC when the samples were exposed to full solar radiation. The possible fate of this DOC will be discussed in the next section.

As discussed earlier, DOC can originate directly from the plant litter or from POC. Once released, DOC can be: (1) utilized directly by microbial activity, (2) photodecayed, (3) coagulated and flocculated to form POC, or (4) discharged from the system. Overall, microbial activity is responsible for the majority of decomposition of macrophyte detritus (Brock 1984). Biologically labile DOC can be consumed by microbes on the order of hours; the quality and quantity of the DOC that remains after this initial period depends largely on the temperature and oxygen availability in the system (Wetzel 2001). The remaining biologically refractory DOC can be transformed into more liable forms with UV exposure. Photodecay of DOC can produce lower-molecular weight (LMW) DOC that is more bioavaliable for microbial consumption. This process of photodecay, in fact, can help regulate DOC levels in aquatic systems (Molot and Dillon 1997). UV-A and UV-B are generally the wavelength ranges considered to be responsible for most of the conversion DOM to LMW DOC, while visible light plays a much less significant role (Molot and Dillon 1997). In a study of DOM from five coastal macrophytes, 58% of the DOC was mineralized to $CO_2$ by microbial action in a 7-day period (Alber and Valiela 1994). While these are coastal macrophytes, similar values were found for freshwater macrophytes in a number of studies (Wetzel 2001). DOM excreted from live macrophytes is largely of low molecular weight (Wetzel 2001). Depending on how long it takes for the discharged water to reach the pumps, assimilation by microorganisms may ort may not remove much of this carbon (Sundh and Bell 1992). As mentioned (Alber and Valiela 1994), it would probably be on the order of days for microbial mineralization to significantly reduce DOC concentrations. If the water discharged from the islands reaches the pumps in just a few hours, microbial mineralization should be minimal.

Photodecay is not only important in the transformation of biologically refractory to liable DOC, but also in the transformation of DOC directly to inorganic carbon (i.e. $CO_2$) (Molot and Dillon 1997). Decay of DOM to inorganic carbon by photooxidation can be significant to an extent comparable to the plankton community respiration in the surface waters of temperate lakes (Graneli et al. 1996). Graneli et al. (1996) found rates of DIC production ranging from 0.92 $\mu g\ C\ h^{-1}\ mg^{-1}$ DOC in a clear-water lake in southern Sweden to 1.52 $\mu g\ C\ h^{-1}\ mg^{-1}$ DOC in a humic lake. Similar rates of 1.56 $\mu g\ C\ h^{-1}\ mg^{-1}$ DOC were seen in samples of DOC derived from dried *Phragmites australis.* (Anesio et al. 1999) Therefore, in a three-day period, the length of study by Anesio et al., approximately 11% of the DOC was transformed to inorganic carbon. If we assume that this rate is representative for a seven-day period, 25% of the DOC will be mineralized. However, it should be noted that microbial rates of decay decline with time (Wetzel 2001). Also, the rates in the Anesion et al. (1999) study were based on the decay of material from emergent vegetation, which are likely to be slower than rates for submerged and floating aquatic vegetation because the latter two have less cellulose and lignin (Wetzel 2001).

Ultraviolet light plays a significant role in photooxidation, however it generally only penetrates the top centimeters of the water column depending on water quality. Thus, the significance of photooxidation in a particular system depends on the depth of the water, mixing patterns (including stratification), and other factors affecting DOC exposure to UV light. Also, since laboratory exposures to UV light are often much more intense than real-world conditions in-situ measurements and experiments should be performed to estimate photodecay rates in the reservoir islands. The significant and variable DOM concentration will strongly affect UV attenuation rates.

Coagulation and flocculation can account for the removal of some DOC to the bottom sediments, especially when the waters are acidified and have elevated aluminum levels. Lakes with high ionic strength may also have significant amounts of flocculation (Molot and Dillon 1997). For example, DOM incubated in fresh seawater, approximately 19% of the DOM transformed to POM (Alber and Valiala 1994). However, since acidic, high aluminum, or high ionic strength conditions are not expected in the reservoir islands, this transformation pathway is not likely to be very important.

Significant amounts of organic matter can be transformed in the pathways just discussed. For submersed and floating plants, up to 80-100 percent of their weight can decompose within a 15-16 week period (Wetzel 2001). A significant amount of this organic matter can eventually be converted to inorganic carbon (Brock 1984; Anesion et al. 1999). Denward and Tranvik (1998) estimated that 14-20% of the emergent macrophyte, *Phragmites australis*, will be transformed to inorganic carbon. However, the rate and method of decomposition varies greatly with plant species and environmental conditions, factors that must be considered when determining the fate of organic carbon and the concentration of organic carbon released from the system. The relationships between diversion timing, discharge timing and plant growth are important factors in organic carbon loading. For example, if discharge coincides with plant senescence or as we discussed above, if the plants suddenly die for whatever reason, the loading to delta channels could be a large percentage of the production on the islands. On the other hand, if discharge coincides with certain, arguably special, clear-water conditions the net effect might be negative loading, that is, the islands could act as a sink for organic carbon in the diverted channel water, especially with high TOC concentrations in winter diversion water. Those clear water conditions include high settling rates of POC, high rates of microbial uptake and metabolism of DOC and high clearance rates of planktonic and sessile metazoans and larger suspension feeders. Young, actively growing and dense submersed vegetation might also facilitate TOC removal by increasing particle settling and providing a substrate for bacteria and metazoans. It might be possible to use relationships among ecological processes and diversion and discharge timing as a management tool but it would require a great deal of study to work out the details and develop a plan. One potential problem is that active and dense macrophyte growth might clear the water during a storage event only to be a major source of DOC in a subsequent storage event because the plants die and decompose due to drawdown. Because of all the potential variation, laboratory experiments and field experiments using project hydrology, Delta peat soils, Delta water and aquatic plants commonly found in the delta are necessary to reasonably estimate what carbon fluxes on the islands might be.

### 4.3.3 Scenario Three, no storage, minimum diversion

Scenario Three is likely to function as a wetland with emergent plants dominating. This scenario is likely to be the most important in terms of photosynthetic production and subsequent release of total organic carbon. The key parameters affecting emergent macrophyte growth should include temperature and flooding. Specifically, the timing, depth and duration of flooding. Shallow water and frequent alternations between flooding and draining of the reservoirs, such as tidal flushing or river flooding would provide favorable conditions for emergent plant growth. More stagnant and deeper wetlands have lower productivity and lower carbon export rates than shallow wetlands with open flows or intermittent flooding. As we discussed above, there are many interacting factors that influence the transformation and export of macrophyte derived organic carbon. Most of these factors are similar for submersed and emergent macrophytes with a major difference being a general slowing of processes with emergent macrophytes because they have relatively more lignin and cellulose than submersed plants. The emergent macrophyte wetland is recognized as the system of maximum productivity anywhere on earth (Wetzel and Sondergaard 1998), thus emergent plants could play a major role in organic carbon loading on the reservoir islands. The likely assemblage of emergent plants in the reservoir islands includes *Typha* spp, *Scirpus* spp, *Phragmites* sp., *Ludwigia peploides*, *Polygonum* sp., *Myriophyllum* aquaticum, and *Hydrocotyle* spp. It is important to point out that while this emergent plant growth and corresponding organic carbon production may be a problem for the treatment of drinking water, it may also be a benefit for fish and wildlife. Of course, many other complex ecological questions enter the picture when considering fish and wildlife, such as the proliferation of invasive species and methylation of mercury.

Sculthorpe (1967) provides a reasonable estimate of emergent macrophyte biomass for species such as *Typha latifolia and Typha angustifolia* at about 4000 g d.w. $m^{-2}$ to 5000 g d.w. $m^{-2}$. This value is about 500% larger that that of submersed macrophytes which we have already discussed as potentially contributing much more organic carbon loading than the peat soils. We have also already discussed the difficulties in translating primary production to organic carbon export. However, Mitsch and Gosselink (1993) provide a range of organic carbon export for freshwater wetlands at 2 to 10 g C $m^{-2}$ $yr^{-1}$. This range is similar to the range of 1 to 9 g C $m^{-2}$ $yr^{-1}$ estimated for the DOC loading from peat soils (Jones and Stokes 2000). Floating aquatic plants may also become established on the reservoir islands in any of the three scenarios, especially *Eichhornia crassipes.* However, it may be desirable to keep *Eichhornia crassipes* off the reservoir islands because it may facilitate other exotic and opportunistic species, reduce dissolved oxygen levels and increase water loss via transpiration by as much as 500% (Sculthorpe 1967, Simenstad et al. 2000). Depending on the management options available and a commitment to early identification of recruits and swift implementation of appropriate management actions it may be relatively easy to keep *Eichhornia crassipes* off of the reservoir islands.

## 4.4 Conclusions and Recommendations

Table 4-2. Predicted TOC Concentrations in Reservoir Island Water from Algae and Vascular Aquatic Plants (mg C $L^{-1}$)

| | Best Case | Expected Range | Worst Case |
|---|---|---|---|
| Scenario 1 | 0.4 | 1 to 6.5 | 12 |
| Scenario 2 | sink | 1 to 10 | 500 |
| Scenario 3 | sink | 5 to 50 | 2000 |

In conclusion, the algae and aquatic plant component of photosynthetic production and subsequent release of total organic carbon from the Delta Wetland Project reservoir islands could be similar to or larger than the peat soils component. This report is a starting point and provides reasonable ranges for organic carbon production and loading from algae and aquatic macrophytes (Table 2). In order to reduce uncertainty and make more specific predictions with reasonable confidence, a larger commitment of resources is necessary and must include both modeling and experimentation with algae and aquatic plants from the Delta. Precise quantitative predictions are an unrealistic expectation relative to the limited time and resources available for the completion of this report. ERA recommends the addition of experimental data specific to the proposed project in order to increase confidence in predictions. Additional studies are needed to properly and thoroughly describe the complex ecological processes that will affect both short term and long term plant growth and carbon export for the reservoir islands.

## 4.5 References

Alber , M. and I. Valiela. 1994. Production of microbial organic aggregates from macrophyte-derived dissolved organic material. Limnol. Oceanogr. 39(1):37-50.

Alpine, Andrea E., and James E. Cloern 1992. Trophic interactions and direct physical effects control phytoplankton biomass and production in an estuary. Limnol. Oceanogr. 37(5):946-955.

Anesion, A.., L. Tranvik, and W. Graneli. 1999. Production of inorganic carbon from aquatic macrophytes by solar radiation. Ecology. 80(6):1852-1859.

APHA-AWWA-WPCF. 1980. Standard methods for the examination of water and wastewater, 15$^{th}$ ed. American Public Health Association, Washington, D.C., 1134 p.

Anderson, L., C. Pirosko, S. Fellows, J. Hironaka, R. DuVall, F. Dietrich, and D. Edwards. 1996. Sub-surface injection systems for control of *Egeria densa* in the Sacramento-San Joaquin Delta. In: L. Anderson (ed.) USDA/ARS, Aquatic Weed Control Investigations Annual Report. pp. 86-92.

Bailey, M. C., and D. P. Hamilton. 1997. Wind induced sediment resuspension: A lake-wide model. Ecol. Modeling 99:217-228.

Bastardo, H. 1979. Laboratory studies on decomposition of littoral plants. Polskie Archiwum Hydrobiologii. 26(3):267-299.

Booth, J. G., R. L. Miller, B. A. McKee, and R. A. Leathers. 2000. Wind-induced bottom sediment resuspension in a microtidal coastal environment. Cont. Shelf Res. 20:785-806.

Brock, T. 1984. Aspects of the decomposition of *Nymphoides peltata* (Gmel.)O.Kuntze (Menyanthaceae). Aquatic Botany. 10:131-156.

Carpenter, S. R., J. J. Cole, J. F. Kitchell and M. P. Pace. 1998. Impact of dissolved organic carbon, phosphorus, and grazing on phytoplankton biomass and production in experimental lakes. Limnol. Oceanogr. 43:73-80.

Carder, K. L., R. G. Steward, G. R. Harvey, and P.B Ortner. 1989. Marine humic and fulvic acids: Their effects on remote sensing of ocean chlorophyll. Limnol. Oceanogr. 24:68-81.

Cloern, J. E. 1987. Turbidity as a control on phytoplankton biomass and productivity in estuaries. Cont. Shelf Res. 7: 1367-1381.

Cloern, James E., 1999. The relative importance of light and nutrient limitation of phytoplankton growth: a simple index of coastal ecosystem sensitivity to nutrient enrichment. Aquatic Ecology 33: 3–16

Cloern, James. 2000. Basic science in support of ecosystem resoration: Lessons from a research program supported by CALFED category III. 2000 CALFED Science Conference Session Notes, Organic Carbon and Lower Trophic Level Processes.

Cole, B. E., and J. E. Cloern. 1984. Significance of biomass and light availability to phytoplankton productivity in San Francisco Bay. Mar. Ecol. Prog. Ser. 17: 15-24.

Cole, B. E., and J. E. Cloern. 1987. An empirical model for estimating phytoplankton productivity in estuaries. Mar. Ecol. Prog. Ser. 36: 299-305.

Cole, B. E., J. E. Cloern, and A. E. Alpine. 1986. Biomass and productivity of three phytoplankton size classes in San Francisco Bay. Estuaries 9: 117-126.

Davies-Colley, R. J., W.N Vant, and D.G. Smith. 1993. Colour and Clarity of Natural Waters: Science and Management of Optical Water Quality. Ellis Horwood.

Denward, C. and L. Tranvik. 1998. Effects of solar radiation on aquatic macrophyte litter decomposition. Oikos. 82:51-58.

[DWR] Department of Water Resouces. 2001. In-Delta Storage Program Draft Report on Engineering Investigations. Sacramento, CA.

Eisma, D. 1993. Suspended Matter in the Aquatic Environment. Springer-Verlag

Federle, T. and J. Vestal. 1982. Evidence of microbial succession on decaying leaf litter in an artic lake. Canadian Journal of Microbiology. 28:686-695.

Ford, T. E. 1993. Aquatic Microbiology, An Ecological Approach. Blaxckwell Scientific Publications. Boston. 518 p.

Graneli, W., M. Lindell, and L. Tranvik. 1996. Photo-oxidative production of dissolved organic carbon in lakes of different humic content. Limnol. Oceanogr. 41:698-706.

Harrison, P. and K. Mann. 1975. Detritus formation from eelgrass (*Zostera marina* L.): The relative effects of fragmentation, leaching, and decay. Limnol. Oceanogr. 20(6):924-934.

Heip,C.H.R.,N.K.Goosen,P.M.J.Herman,J.Kromkamp,J.J.Middelburg,andK.Soetaert. 1995. Production and consumption of biological particles in temperate tidal estuaries. Oceanogr. Mar. Biol. Annu. Rev. 33: 1-149.

Jung, Marvin and Lori Weisser. 1999. A trial experiment on studying short-term water quality changes in flooded peat soil environments. California Department of Water Resources. Sacramento, CA. 54 p.

Jones and Stokes. 1990. Delta Wetlands Project. Environmental Impact Report/Environmental Impact Statement. California Department of Water Resources. Sacramento, CA.

Jones and Stokes. 1995. Delta Wetlands Project. Environmental Impact Report/Environmental Impact Statement. California Department of Water Resources. Sacramento, CA.

Jones and Stokes. 2000. Delta Wetlands Project. Environmental Impact Report/Environmental Impact Statement. California Department of Water Resources. Sacramento, CA.

Jung, Marvin and Lori Weisser. 2000. Final report on Experiment #2: Seasonal water quality changes in peat soil environments due to peat soil, water depth and water exchange rate. California Department of Water Resources. Sacramento, CA. 85 p.

Jung, Marvin. 2001. Total organic carbon evaluation. Presented at the June 20,2001 IDS Stakeholders Meeting. California Department of Water Resources. Sacramento, CA. 9 p.

Kromkamp, J., J. Peene, P. Van Rijswijk, A. Sandee, and N. Goosen. 1995. Nutrients, light and primary production by phytoplankton and microphytobenthos in the eutrophic, turbid Westerschelde estuary. Hydrobiologia 311: 9-19.

Lee, R. E. 1989. Phycology. Cambridge University Press. Cambridge. 645 p.

Losee, R. F and R. G. Wetzel. 1993. Littoral flow rates within and around submersed macrophyte communities. Freshwater Biology. 29: 7-17.

Madigan, M. T., J. M. Martinko and J. Parker. 1997. Biology of Microorganisms. Prentice Hall. Upper Saddle River. 986 p.

Mann, K. 1998. Productivity and use of detritus in various freshwater, estuarine, and coastal marine ecosystems. Limnol. Oceanogr. 33(4, part 2):910-930.

Mitsch, W. J. and J. G. Gosselink. 1993. Wetlands. Van Nostrand Reinhold, New York. 722 p.

Molot, L. and P. Dillon. 1997. Photolytic regulation of dissolved organic carbon in northern lakes. Global Biogeochemical Cycles. 11(3):357-365.

Platt, T. 1986. Primary production of the ocean water column as a function of surface light intensity: algorithms for remote sensing. Deep-Sea Res. 33: 149-163.

Platt, T., S. Sathyendranath, C. M. Caverhill, and M. R. Lewis. 1988. Ocean primary production and available light: further algorithms for remote sensing. Deep-Sea Res. 35: 855-879.

Polunin, N. 1982. Processes contributing to the decay of read (*Phragmites australis*) litter in fresh water. Arch. Hydrobiologica. 94:182-209.

Pond, Stephen, and George L. Pickard. 1983. Introductory Dynamical Oceanography. Pergamon Press, Oxford, pp.329.

Sculthorpe, C. D. 1967. The Biology of Aquatic Vascular Plants. Edward Arnold Ltd. London. 610 p.

Simenstad, C., J. Toft, H. Higgins, J. Cordell, M. Orr, P. Williams, L. Grimaldo, Z. Hymanson and D. Reed. 2000. Sacramento/San Joaquin Delta Breached Levee Wetland Study (BREACH). Preliminary Report. University of Washington. Seattle. 51 p.

Smith C. S. and J. W. Barko. 1990. Ecology of Eurasian Watermilfoil. Journal of Aquatic Plant Management. 28: 55-64.

Sundh, I. and R. Bell. 1992. Extracellular dissolved organic carbon released from phytoplankton as a source of carbon for heterotrophic baterial in lakes of different humic content. Hydrobiologia. 229:93-106.

Swift, T. J. 2000. Unpublished data used in Ph.D. dissertation research. University of California, Davis.

Wetzel, R. G. 2001. Limnology 3$^{rd}$ ed. Academic Press: San Diego. 1006 p.

Wetzel, R. G. and M. Sondergaard. 1998. Role of submerged macrophytes for the microbial community and dynamics of dissolved organic carbon in aquatic ecosystems. In: Jeppesen, E. el al. (Eds.) 1998. The structuring Role of Submerged Macrophytes in Lakes. Springer, New York. P. 133-148.

Vant, W. N., R. J Davies-Colley, J. S. Clayton, and B. T. Coffey, 1986. Macrophyte depth limits in North Island (New Zealand) lakes of differing clarity. Hydrobiologia 137:55-60.

## Chapter 5 Water Temperature and Dissolved Oxygen Studies

### 5.1 Introduction

A preliminary water quality study was conducted to determine the temperature and dissolved oxygen (DO) impacts of the In-Delta Storage project within the flooded storage islands and to the adjacent riverine system. Water temperature and DO requirements for the In-Delta Storage project are specified in State Water Resources Control Board Decision 1643. According to Condition 20b of Decision 1643:

*Permittee shall minimize or avoid any adverse effects to water temperature due to discharge from a reservoir as follows:*

*i.) When the temperature differential between the discharge and receiving waters is greater than 20$^o$ F, there shall be no discharge.*
*ii.) When channel water temperature is 55$^o$ F or higher but less than 66$^o$ F, discharge shall not increase channel temperature by more than 4$^o$ F.*
*iii.) When channel water temperature is 66$^o$ F or higher but less than 77$^o$ F, discharge shall not increase channel temperature by more than 2$^o$ F.*
*iv.) When channel temperature is 77$^o$ F or higher, discharge shall not increase channel temperature by more than 1$^o$ F.*

Dissolved oxygen requirements are specified under Condition 19a of Decision 1643:

*Permittee shall not discharge water from the reservoir islands if the water discharged has a dissolved oxygen level of less than 6.0 mg/l or would depress the dissolved oxygen level in the adjacent channel of the Delta to less than 5.0 mg/l, or would depress the dissolved oxygen level in the reach of the San Joaquin River between Turner Cut and Stockton to less than 6.0 mg/l during September through November.*

The preceding temperature and DO criteria were developed to protect the fishery resources in the Delta. To provide an understanding of the project impacts to water quality, observed temperature and DO data was analyzed and a heat budget and DO balance model was developed. The results this report are not intended to be final and conclusive, but rather it should provide insight on the temperature and DO behavior within the island system and the possibility of exceedances to Conditions 20b and 19a.

### 5.2 Methodology

According to project specifications of the In-Delta Storage Project Study, the temperature and DO analysis would be a localized study of the two reservoir islands: Webb Tract and Bacon Island. A temperature and DO analysis using a river network model (such as DSM2) was not conducted due to the lack of an existing island temperature and DO algorithm and due to time constraints. The temperature and DO study was conducted through a combination of analyzing observed data and through spreadsheet modeling. The analyses of observed data provided a range of temperature and DO values in the Delta and established upper and lower bounds. An island temperature and DO algorithm was developed with an Excel spreadsheet and the model was tailored to the unique specifications of this project. The temperature and DO algorithm is based on the fundamental components of the heat budget and dissolved oxygen balance.  Impacts to the adjacent river were analyzed through mass balance equations.   The modeling was conducted using a daily time step and using daily averaged meteorological and flow data.  It was also assumed that the flooded islands would be completely mixed due to the high winds that are experienced throughout the year in the interior Delta.  Four years were investigated for temperature modeling: 1998, 1999, 2000 and 2001.  The DO modeling examined the period 1998 to 2000.

### 5.3 Data Collection Stations

The meteorological and flow stations used in the heat budget and mass balance equations are depicted in Figure 5-1 and summarized in Table 5-1.  The heat budget algorithm requires data for shortwave solar radiation, wind speed and air temperature. Shortwave solar radiation data was taken from Cimis Station #140 located on Twitchell Island.  Wind speed from Rio Vista was used for both Webb Tract and Bacon Island. Air temperature data representative of Webb Tract was taken from the Rio Vista station while air temperatures from the Stockton Ship Canal were used for Bacon Island. These assignments are summarized in Table 5-2.  Stockton and Rio Vista air temperatures are shown in Figures 5-2 and 5-3 respectively.   Annual and seasonal average air temperatures for the periods January 1 to December 31 and April 1 to August 31 are summarized in Table 5-3.  The April 1 to August 31 time window is of interest since this is the period when releases from Webb Tract and Bacon Island may occur.

Table 5-3 indicates that the years 2000 and 2001 were warmer than the years 1998 and 1999.  For the April-August time window, the warmest year, 2001, is 2.8 degrees higher than the coolest year, 1998.  From Figures 5-2 and 5-3 it appears that the year 2000 (blue) and particularly 2001 (yellow) had a warm spring and early summer, but had milder temperatures for the remainder of the year.  In contrast, the years and 1999 (red) and particularly 1998 (magenta) appear to have cooler temperatures in the winter and spring with temperatures increasing in the mid to late summer.

The two flow stations used in the Webb Tact and Bacon Island mass balances are the San Joaquin River at Jersey Point and Old River at Bacon Island.  Although not adjacent to Webb Tract, the Jersey Point station is the closest flow gage to the island. Jersey Point daily average flows (Figure 5-4) appear to be 2 to 3 times higher in 1998 than in 1999 and 2000.  A daily peak flow of over 90,000 cfs was observed in 1998 as opposed to roughly 40,000 cfs in 1999 and 2000.  During the lower volume years, the Jersey Point flow fluctuated between positive and negative values starting in early spring as the river was affected by tidal influences.

Old River (Figure 5-5) is a smaller and slower moving river as opposed to the San Joaquin.  Daily average flows at Bacon Island in 1998 peaked around 9000 cfs and didn’t reverse flow until mid-summer.   In the lower volume years of 1999 and 2000, the flow reversed in mid winter and maintained mostly negative daily flow values for the remainder of the year.  The cause of the flow reversal is a combination of tidal influences and pumping at the State and Federal pumping plants into Clifton Court Forebay.

**TABLE 5-1** DELTA METEROLOGICAL AND FLOW STATIONS

| Station Name | Database Source | Frequency of Data Collection | Period of Record |
|---|---|---|---|
| Rio Vista Air Temperature | CDEC[1] | Hourly | May 1983 - present |
| Rio Vista Wind speed | CDEC | Hourly | May 1983 - present |
| Stockton Air Temperature | IEP[2] | Hourly | May 1983 –Sep 2001 |
| Twitchell Island Solar Radiation | UC IPM[3] | Daily | Jan 1997 - present |
| San Joaquin at Jersey Point Flow[4 5] | IEP | 15 Min | Dec 1993 – Nov 2000 |
| Old River at Bacon Island Flow[4 5] | IEP | 15 Min | Dec 1985 - Aug 2000 |

[1] California Data Exchange Center
[2] Interagency Ecological Program
[3] University of Integrated Pest Management Project
[4] Flow data for 2001 not available
[5] 15-minute flows were daily averaged for use in this study

**TABLE 5-2** METEROLOGICAL AND FLOW STATION ASSIGNMENTS

| Station Type | Webb Tract | Bacon Island |
|---|---|---|
| Shortwave Solar Radiation | Twitchell Island Cimis[1] Station #140 | Twitchell Island Cimis Station #140 |
| Wind speed | Rio Vista | Rio Vista |
| Air Temperature | Rio Vista | Stockton Ship Canal |
| Channel Flow | San Joaquin at Jersey Point | Old River at Bacon Island |

[1]California Irrigation Management Information System

**TABLE 5-3** ANNUAL AND SEASONAL AVERAGE AIR TEMPERATURE

(Based on Daily Average Temperatures)

| Year | Rio Vista | | Stockton Ship Canal | |
|---|---|---|---|---|
| | Ave Deg F (Jan-Dec) | Ave Deg F (Apr-Aug) | Ave Deg F (Jan-Dec) | Ave Deg F (Apr-Aug) |
| 1998 | 59.2 | 65.8 | 58.8 | 65.9 |
| 1999 | 58.9 | 64.9 | 59.3 | 66.1 |
| 2000 | 59.8 | 67.0 | 60.0 | 67.8 |
| 2001 | * | 68.6 | * | 68.7 |

***** Only January –September air temperature values available

Water temperature stations are displayed in Figure 5-6 and summarized in Table 5-4. The stations cover a variety of temperature conditions in the Delta from the main stem San Joaquin, slow flowing tributaries, agricultural drains, and fairly stagnant large water bodies. The temperature stations used for comparisons and mass balances are summarized in Table 5-5. The San Joaquin River has two continuous recording stations near Webb Tract at San Andreas Landing and Prisoners Point. San Andreas has been operational since February 1999 while Prisoners Point has been operating seasonally since April 1997. These two stations appear to have the lowest temperatures of the stations analyzed and are perhaps subjected to cooling influence of the Pacific Ocean, and the Mokelumne River that flows out between the two locations. The closest continuous recording station near Bacon Island is Old River at Holland Cut, which has been operational since February 1999. Intermittent temperature readings are taken at Old River at Bacon Island and Old River at Highway 4 usually on a monthly basis.

**TABLE 5-4** DELTA WATER TEMPERATURE STATIONS

| Station Name | Database Source | Frequency of Data Collection | Period of Record |
|---|---|---|---|
| San Joaquin at San Andreas Landing | CDEC[1] | Hourly | Feb 1999 - present |
| San Joaquin at Prisoners Point | IEP[2] | Seasonal, 15 min | Apr 1997 – Jul 2000 |
| Old River at Holland Cut | CDEC | Hourly | Feb 1999 - present |
| Old River at Bacon Island | WDL[3] | Intermittent | Nov 1994 – Mar 2001 |
| Old River at Highway 4 | WDL | Intermittent | Mar 1989 – Mar 2001 |
| Twitchell Agricultural Drain | WDL | Intermittent | Jul 1989 – Mar 2001 |
| Bacon Agricultural Drain | WDL | Intermittent | Jan 1990 – Nov 2000 |
| Franks Tract | IEP | Intermittent | Aug 1998 - Jun 2001 |
| Clifton Court Inflow | WDL | Intermittent | Jan 1984 - Oct 1994, Feb 1998 - Dec 2000 |
| Stockton Ship Canal | IEP | Hourly | May 1983 – Sep 2001 |

[1] California Data Exchange Center
[2] Interagency Ecological Program
[3] California Department of Water Resources Water Data Library

Water temperatures from agricultural drains and stagnant large water bodies were also analyzed. Both Twitchell Island, northwest of Webb Tract, and Bacon Island have intermittent temperature readings taken at agricultural drains. Franks Tract is a flooded Delta Island, south of Webb Tract, with intermittent temperature data. The levees of Franks Tract were breached in several locations, and the hydraulics through the island is more representative of a flow through system rather than a reservoir system. Sporadic temperature data is also available for the Old River at the intake to Clifton Court Forebay. Temperatures taken at this station may be slightly different than at mid-forebay, however this is the only known station close to this large standing water body. As a final comparison, hourly temperature data from the Stockton Ship Canal at Burns Cutoff was also investigated. The Stockton Ship Canal is a deep, slow flowing reach of the San Joaquin River located west of Stockton. The stagnant hydraulics of the canal, in combination with warm Stockton temperatures and lower wind velocities, subject the ship canal to considerable heating during the summer.

**TABLE 5-5** WATER TEMPERATURE STATION ASSIGNMENTS

| Webb Tract | Period Used | Bacon Island | Period Used |
|---|---|---|---|
| San Joaquin at San Andreas | (1999-2001) | Old River at Holland Tract | (1999-2001) |
| San Joaquin at Jersey Point | (1998) | Old River at Bacon Island | (1998) |

## 5.4 Analysis of Observed Temperature Data

An analysis of observed data was conducted to provide a range of temperatures in the Delta and to establish upper and lower bounds. Plots of observed water temperature data are given in Figures 5-7 to 5-10. The plots are based on hourly temperature readings for the continuous stations, and the recorded temperatures and times for spot readings. The year 2000 will be analyzed first since this year possesses the most observed data. The stations compared will be Old River at Bacon Island, Bacon Ag Drain, Old River at Highway 4, Clifton Court Inflow, Franks Tract, Old River at Holland Cut, San Joaquin River at San Andreas, San Joaquin River at Prisoners Point, and the Stockton Ship Canal. The coolest water temperatures are on the San Joaquin River at

San Andreas Landing (aqua line) and Prisoners Point (yellow line). The temperatures at these two stations are fairly similar with temperatures at the downstream station, San Andreas, being slightly lower, perhaps due to cooling by the Mokelumne River. The San Joaquin River at San Andreas Landing reached a peak hourly temperature of 75.4$^{o}$ F in the early evening of August 2, 2000.

Temperatures at Old River at Holland Cut (purple line) are 1$^{o}$ F to 2$^{o}$ F higher than the San Joaquin temperatures throughout the winter, but rise 2$^{o}$ F to 4$^{o}$ F higher during occasional temperature peaks in the summer. The Old River at Holland Cut reached a peak temperature of 79$^{o}$ F in early August 2000. Temperature differences at Holland Cut and the San Joaquin stations are possibly due to the reverse flow hydraulics on the Old River that draws from the pool at Franks Tract. It appears that Franks Tract temperatures (red triangles) are similar to temperatures at Holland Cut (purple line). In addition, water temperatures at Clifton Court intake (blue diamonds) closely follow temperatures at the Old River at Holland Cut.

The Stockton Ship Canal has the highest temperatures of the continuous recording stations analyzed. In late June and early August, water temperatures exceeded 80$^{o}$ F for several days, with a peak temperature of 83.5$^{o}$ F recorded in the late afternoon of August 2, 2000. Differences in temperature between the Stockton Ship Canal and the San Joaquin at San Andreas Landing range between roughly 2$^{o}$ F to 8$^{o}$ F during the summer. Summer temperature differences between the Stockton Ship Canal and the Old River at Holland Cut are roughly 2$^{o}$ F to 6$^{o}$ F.

The temperatures for Old River at Bacon Island (magenta boxes), Old River at Highway 4 (brown circles) and the Bacon Island Agricultural Drain (light blue Xs) appear to have the highest values of the intermittent readings. At some times, the temperatures at the three stations are identical while other times the temperature at Bacon Ag Drain is 2$^{o}$ to 3$^{o}$ F higher and in some cases (see 1998 and 1999) lower. The exact cause for this deviation is not known, but a possible reason is sampling error. During the year 2000, the Bacon Island water temperatures appear to follow temperatures recorded at the Stockton Ship Canal. The higher temperatures at Old River at Bacon Island can perhaps be attributed to the sampling site, which, according to the Municipal Water Quality Investigations Program (2001), is located near the bank in an area surrounded by tulles and other vegetation. The area does not get much mixing and the slower moving water in this shallow area would probably be subjected to significant solar gain, thus increasing the water temperature.

The year 2001 had similar meteorological conditions to the year 2000, and the water temperature stations with available data are plotted in Figure 5-8. Trends detected in the year 2000, are also noticed in 2001. Of the continuous recording stations, the San Joaquin River at San Andreas Landing (aqua line) had the lowest water temperatures while the Stockton Ship Canal (orange line) had the highest. Peak water temperatures at San Andreas Landing and the Stockton Ship Canal were 77.3$^{o}$ F and 83.8$^{o}$ F respectively, both recorded in the late afternoon of June 22, 2001. Old River at Holland Cut (purple line) recorded a high temperature of 80.1$^{o}$ F in the early evening of July 3,

2001. Franks Tract (red triangles) temperatures again closely follow the temperatures of Old River at Holland Tract, while the Old River at Bacon Island (magenta squares) and at Highway 4 (brown circles) appear to follow Stockton Ship Canal temperatures. Temperature differences between the Stockton Ship Canal versus San Andreas Landing and versus Holland Cut are both in the range of $2^o$ to $8^o$ F.

The year 1999 (Figure 5-9) was a slightly cooler year than 2000 and 2001. Peak water temperatures at San Andreas Landing (aqua line), Holland Cut (purple line) and the Stockton Ship Canal (orange line) were 75.8 $^o$ F (June 30), 79.8 $^o$ F (July 12) and $82.4^o$ F (June 29) respectively. Differences between Stockton Ship Canal temperatures and San Andreas Landing temperatures during the summer range from about $2^o$ to $8^o$ F. The summer differences between the Stockton Ship Canal and Holland Cut range from approximately $1^o$ to $8^o$ F. Again Franks Tract temperatures (red triangles) and Clifton Court intake (blue diamonds) closely follow Old River at Holland Tract temperatures. Oddly, in 1999, the spot temperature readings at Old River at Bacon Island (magenta squares), at Highway 4 (brown circles), and Bacon Ag Drain (light blue Xs) seem to follow the Holland Tract (purple line) data more closely.

The year 1998 had similar temperatures to 1999, and it also had highest winter flows. Figure 5-10 displays the available water temperature data, which is unfortunately lacking the continuous data of San Andreas Landing and Holland Cut. Seasonal data for the San Joaquin at Prisoners Point (yellow line) is the only continuous data to compare Stockton Ship Canal temperatures to. As expected from a cooler year with higher flows, the water temperatures of the San Joaquin River at the Stockton Ship Canal (orange line) and the San Joaquin River at Prisoners Point are fairly identical. The shorter residence time, due to higher flows, prevented the Stockton Ship Canal from storing heat. Stockton Ship Canal temperatures peaked at $79.7^o$ F on August 5, 1998. Based on the available data, the highest temperature reading for Prisoners Point was $78.8^o$ F recorded on July 20, 1998. In addition, temperatures around the Delta appear to be identical as can be seen in the blending of Clifton Court intake (blue diamonds) and Franks Tract (red triangles) temperatures with the Stockton Ship Canal. Using the Old River at Bacon Island station as a comparison to Prisoners Point, it appears the temperature difference for 1999 is roughly between $0^o$ F to $5^o$ F.

### 5.5 The Island Water Temperature Algorithm

An island temperature model was developed to study the temperature differences that would occur between the flooded islands and the adjacent river channel. The island temperature model was written in Excel to tailor the model to project specifications including addressing certain temperature criteria issues, producing specialized plots, and linking the temperature output to a specialized dissolved oxygen model. The island temperature algorithm uses daily averaged meteorological, temperature, and flow data and is based on a daily time step. It assumes complete mixing within flooded islands due to the high winds experienced in the interior Delta. As a result, thermal stratification will not be considered in this study. Moreover, modeling a stratified reservoir is not practical unless temperature profile data has been collected over a period of time to calibrate and verify the model. Volume, surface area and depth relationships are based on area-capacity and depth-capacity curves provided by The DW Project. The algorithm is based on the fundamental components of the heat budget equation displayed in Figure 5-11 and given by:

$$\Delta q = q_{io} + (q_a - q_b) + q_s - q_c - q_e$$

Where

$\Delta q$ is the change in the heat capacity of the water body
$q_{io}$ is heat transfer in or out from filling and releasing
$q_a$ is the longwave radiation emitted from the atmosphere
$q_b$ is the longwave back radiation emitted from the water surface
$q_s$ is solar short wave radiation gain
$q_c$ is the loss or gain from convective heat transfer (sensible heat)
$q_e$ is loss of energy due to evaporation or gain from condensation (latent heat)
q is in Units in energy flux density: Btu/day-ft$^2$ or cal/day-cm$^2$ or W/m$^2$

Heat transfer due to filling the reservoirs can be determined through

$$q_{io} = \frac{\rho C_p Q_d T_r}{Area}$$

Where:

$\rho$ = density of water = 1000 kg/m$^3$ or 62.4 lbm/ft$^3$
$C_p$ = specific heat of water = 4.182 kJ/kg-$^o$C or 1.00 Btu/lbm-$^o$F
$Q_d$ = Pumping rate of river water into the island
$T_r$ = Temperature of incoming river water
Area = Surface area of the flooded island

Solar shortwave ($q_s$) radiation is the radiation emitted from the sun. It is dependent on the solar altitude, which will vary with the date, time of day, and location on the earth's surface. Shortwave radiation is also dependent on the scattering and absorption of sunlight, reflection at the water surface, and shading effects. Solar radiation is normally obtained through direct measurements and, for this study, was taken from CIMIS station #140 at Twitchell Island. Longwave radiation is broken into two components: atmospheric and water surface back radiation. Atmospheric longwave radiation ($q_a$) is emitted by the atmosphere and terrestrial objects and is defined by:

$$q_a = \frac{\sigma (T_a + 273)^4 (A + 0.031\sqrt{e_a})(1 - R_L)}{Area}$$

Where:

$\sigma$ = Stefan-Boltzman Constant = 11.7x10$^{-8}$ cal/(cm$^2$-day-K$^4$)

$T_a$ = Temperature of the air ($^oC$)
A = a coefficient (0.5-0.7)
$e_a$ = air vapor pressure (mm Hg)
$R_L$ =reflection coefficient=0.03.

The water surface emits longwave radiation back to the atmosphere. This back radiation ($q_b$) is a function of water temperature and is given by:

$$q_b = \frac{-\varepsilon\sigma\,(T_w + 273\,)^4}{Area}$$

Where:

ε = emmissivity of water (approximately 0.97)
σ = Stefan-Boltzman Constant = 11.7x10-8 cal/(cm$^2$-day-K$^4$)
$T_w$ = Temperature of the water ($^oC$).

Atmospheric radiation is a heat gain (+) to the waterbody while back radiation is a heat loss (-). Back radiation is usually larger than atmospheric radiation so the term ($q_a$-$q_b$) is a net heat loss to heat budget equation.

Sensible heat, or convection, is the heat transfer that occurs due to the mass movement of fluids. In reservoir systems, this heat transfer occurs through wind blowing over the water surface. The convection term ($q_c$) is a function of the wind velocity and the temperature gradient between the water and the air.

$$q_c = \frac{-\,cf\ \ (U_w)(\,T_w - T_a\,)}{Area}$$

Where:

c = Bowen's coefficient (approximately 0.47 mm Hg/$^oC$)
$f(U_w) = 19.0 + 0.95U_w^2$
$U_w$ = wind velocity in m/s
$T_w$ = Temperature of the water ($^oC$)
$T_a$ = Temperature of the air ($^oC$)

Latent heat is the heat transfer that occurs though a change in phase from a liquid to a vapor (evaporation) or a vapor to a liquid (condensation). Latent heat is a function of the wind speed and the gradient between the saturation vapor pressure at the water surface and the air vapor pressure. Evaporative heat loss is highest when the relative humidity is low and wind velocities are high.

$$q_e = \frac{-f(U_w)(e_w - e_a)}{Area}$$

Where:

$f(U_w)= 19.0 + 0.95U_w^2$
$U_w$ = wind velocity in m/s
$e_w$ = saturation vapor pressure at water surface (mm Hg)
$e_a$ = air vapor pressure (mm Hg)

In the island temperature algorithm, the individual components of the heat budget are computed and substituted into the budget equation to compute the change in heat storage.

$$\Delta q = q_{io} + (q_a - q_b) + q_s - q_c - q_e$$

The total heat at the current time step is equal to the total heat of the previous time step plus the change in storage.

$$q_t = q_{t-1} + \Delta q$$

Where:

$\Delta q$ = the change in the heat storage of the water body
$q_t$ = total heat at time t
$q_{t-1}$ **=** the total heat of the previous timestep

The temperature of the current time step can then be computed through the following equation:

$$T_{i,t} = \frac{q_t Area}{\rho C_p V}$$

Where:

$q_t$ = total heat
ρ = density of water
$C_p$ = specific heat of water
V = Water volume in the flooded island.

Impacts of discharging island water to the adjacent river can be determined through a mass balance equation.

Where

$C_f$ = final concentration of constituent (Temperature or DO)
$C_i$ = concentration of constituent on the island (Temperature or DO)
$C_r$ = concentration of constituent in the river (Temperature or DO)

$Q_d$ = Discharge from the island
$Q_r$ = Flow in the river

## 5.6 Water Temperature Model Results

Temperature modeling was conducted on Webb Tract and Bacon Island for the years 1999 and 2000, and for the period January 1 to September 30, 2001. Due to a lack of continuous water temperature data for Bacon Island in 1998, only Webb Tract was modeled that year. The reservoir islands are assumed to be annually evacuated to a final depth of 3.3 feet (1 meter) and this will be the initial condition at the beginning of the model simulation on January 1. The operational scenario assumed in this study would be the filling of Bacon Island starting around January 1 at a rate of 8000 acre-feet/day or 4033 cfs. This diversion is consistent with the combined maximum monthly average rate of 4000 cfs given in the *In-Delta Storage Program Draft Description of Alternatives*. At this rate, Bacon Island will be filled to a capacity of 108.5 TAF by mid-January. Once Bacon Island is filled, diversions will commence for Webb Tract at a rate of 8000 acre-feet/day. Webb Tract will be filled near the end of January bringing the total storage of the two islands to about 217 TAF. The operational fill scenario is depicted in Figure 5-12.

### 5.6.1 Verification Against Year 2000 Data

The water temperature model was tested and compared against data from the year 2000. An actual calibration of the model was not feasible since temperature data from a flooded Delta Island was not available. Although Franks Tract is the closest system identical to a flooded island, the levees there have been breached, thereby creating a flow-through system with temperatures apparently similar to the nearby channels. Temperatures at Clifton Court Forebay intake also appear to be similar to the adjacent river system. As a result, meteorological data was applied to the temperature model and output was computed directly without calibration.

In an effort to verify the model, the computed water temperatures for Webb Tract were compared to the Stockton Ship Canal as this station would serve as an upper temperature bound. Bacon Island computed water temperatures were compared to the Stockton Ship Canal and Old River at Bacon Island, which served as upper temperature bounds. Other stations including the San Joaquin at San Andreas Landing, San Joaquin at Prisoners Point and Old River at Holland Cut were plotted as lower temperature bounds. For the continuous recording temperature stations at San Andreas Landing, Prisoners Point, Holland Cut, and the Stockton Ship Canal, the data was converted from hourly to daily averaged values. This would allow equal comparison to the daily average temperatures computed from the model. The comparison plot for Webb Tract (Figure 5-13) shows that the computed water temperatures (blue line) fall within the upper temperature bounds of the Stockton Ship Canal (orange circles) and the lower bounds of the San Joaquin River at San Andreas Landing (aqua circles) and Prisoners Point (light blue Xs). Bacon Island computed temperatures (Figure 5-14) fall within the upper bounds of the Stockton Ship Canal (orange circles) and Old River at Bacon Island (red circles) and the lower bounds of the Old River at Holland Cut (purple circles). In the lieu of actual calibration and verification data, falling within the upper and lower bound of observed data gives a fair level of confidence that the temperature model is performing adequately.

### 5.6.2 Summary of Temperature Modeling Results

A plot of Webb Tract water temperatures for the year 2000 is given in Figure 5-15. The red line represents computed Webb Tract island water temperatures while the blues circles are observed San Joaquin at San Andreas Landing temperatures. Also shown is the temperature difference between Webb Tract island and San Andreas Landing (magenta line) and Rio Vista air temperatures (green line). As displayed in the plot, computed island water temperatures are highly dependent on the peaks and dips in air temperature. A maximum island water temperature of 79.5$^o$ F was reached on August 2, 2000, coinciding with the peak air temperature for the month. The average computed water temperatures for the periods January-December, April-August, and June-August are 63.6$^o$ F, 72.1$^o$ F, and 75.2$^o$ F respectively. The maximum temperature difference at Webb Tract is 8.9$^o$ F reached on May 23, 2000. The average temperature difference is in the range of 3$^o$ F to 4$^o$ F.

Computed Bacon Island water temperatures (red line), along with observed Holland Cut water (blue circles) and Stockton air temperatures (green line) are shown in Figure 5-16. The maximum Bacon Island computed daily temperature is 80.1 degrees reached on August 2, 2000. Average computed daily temperatures are 63.6$^o$ F (Jan-Dec), 72.6$^o$ F (Apr-Aug), and 75.8$^o$ F (Jun-Aug). The maximum computed daily temperature difference at Bacon Island was 6.2$^o$ F with an average daily temperature difference between 2$^o$ F to 3$^o$ F. A summary of statistics for the year 2000 simulation is given in Table 5-6.

Temperature plots for Webb Tract and Bacon Island for the years 2001 and 1999 are given in Figures 5-17 to 5-20. A temperature plot for only Webb Tract is given in 1998 (Figure 5-21) due to a lack of continuous temperature data for Bacon Island. Temperature departures between island temperatures and the adjacent river are fairly consistent with the departures seen in the observed data in Section 5.4. None of the years simulated had a maximum temperature difference greater than 20$^o$ F, and therefore would not violate the first criteria of Condition 20b of Decision 1643, which states:

*i.) When the temperature differential between the discharge and receiving waters is greater than 20$^o$ F, there shall be no discharge.*

Note that the computed temperature differences are based on a daily averages and computations with a finer time step may yield higher differences. A summary of statistics for the years 2001, 1999 and 1998 is given in Tables 5-7 to 5-9.

### 5.6.3 Summary of Temperature Mass Balance Results

Mass balances were conducted to determine impacts to river temperatures due to discharging island water back to the channel. Webb Tract and Bacon Island were analyzed for 2000 and 1999, and only Webb Tract in 1998 due to a lack of continuous water temperature data at Bacon Island. Flow data was not yet available for 2001 to conduct a mass balance on either Bacon Island or Webb Tract for that year. The mass balance was conducted for the period April 1 to August 31: the period when discharges to the channel would likely occur. The discharge rate for the mass balance was assumed to be 4000 cfs, which is consistent with the combined maximum monthly average rate given in the *In-Delta Storage Program Draft Description of Alternatives.* A discharge operation plan was not developed, but rather a constant 4000 cfs was applied throughout the time window to determine the final river temperature if a discharge were to occur that day. According to the last three criteria of Condition 20b of Decision 1643:

*ii.) When channel water temperature is 55 $^{o}$ F or higher but less than 66 $^{o}$ F, discharge shall not increase channel temperature by more than 4 $^{o}$ F.*
*iii) When channel water temperature is 66 $^{o}$ F or higher but less than 77 $^{o}$ F, discharge shall not increase channel temperature by more than 2$^{o}$ F.*
*iv.) When channel temperature is 77 $^{o}$ F or higher, discharge shall not increase channel temperature by more than 1 $^{o}$ F.*

**TABLE 5-6** SUMMARY OF 2000 TEMPERATURES

| Statistic | Webb Tract Computed Temperatures (deg F) | Bacon Island Computed Temperatures (deg F) | Webb Tract Temperature Differences (deg F) | Bacon Island Temperature Differences (deg F) |
|---|---|---|---|---|
| Maximum (Jan-Dec) | 79.5 | 80.1 | 8.9 | 6.2 |
| Average (Jan-Dec) | 63.6 | 63.6 | 3.3 | 2.6 |
| Average (Apr-Aug) | 72.1 | 72.6 | 3.8 | 2.8 |
| Average (Jun-Aug) | 75.2 | 75.8 | 3.5 | 2.6 |

**TABLE 5-7** SUMMARY OF 2001 TEMPERATURES

| Statistic | Webb Tract Computed Temperatures (deg F) | Bacon Island Computed Temperatures (deg F) | Webb Tract Temperature Differences (deg F) | Bacon Island Temperature Differences (deg F) |
|---|---|---|---|---|
| Maximum (Jan-Sep) | 83.8 | 83.1 | 8.5 | 8.6 |
| Average (Jan-Sep) | 66.2 | 66.3 | 3.1 | 2.5 |
| Average (Apr-Aug) | 73.7 | 73.9 | 4.2 | 3.2 |
| Average (Jun-Aug) | 76.8 | 76.8 | 4.3 | 2.8 |

**TABLE 5-8** SUMMARY OF 1999 TEMPERATURES

| Statistic | Webb Tract Computed Temperatures (deg F) | Bacon Island Computed Temperatures (deg F) | Webb Tract Temperature Differences (deg F) | Bacon Island Temperature Differences (deg F) |
|---|---|---|---|---|
| Maximum (Jan-Dec) | 80.6 | 79.9 | 8.0 | 7.9 |
| Average (Jan-Dec) | 62.6 | 62.6 | 3.3[1] | 2.7[2] |
| Average (Apr-Aug) | 68.6 | 69.6 | 3.0 | 2.8 |
| Average (Jun-Aug) | 71.8 | 72.3 | 2.3 | 1.5 |

[1] Difference is taken form February 23, 1999 to December 31, 1999
[2] Difference is taken from February 25, 1999 to December 31, 1999

**TABLE 5-9** SUMMARY OF 1998 WEBB TRACT TEMPERATURES

| Statistic | Webb Tract Computed Temperatures (deg F) | Webb Tract Temperature Differences (deg F) |
|---|---|---|
| Maximum (Jan-Dec) | 80.2 | 5.6 |
| Average (Jan-Dec) | 63.0 | X |
| Average (Apr-Aug) | 70.9 | 3.2[1] |
| Average (Jun-Aug) | 74.2 | 2.2[2] |

X - Not available due to limited observed data
[1] Average temperature difference taken from period April 1 – July 22, 1998
[2] Average temperature difference taken from period June 1 – July 22, 1998

The mass balance plot for Webb Tract for the year 2000 is shown in Figure 5-22. Shown on the mass balance plot is computed Webb Tract water temperature (red line), San Joaquin at San Andreas Landing temperatures (blue circles), Webb Tract discharges (brown triangles) and San Joaquin at Jersey Point flows (green line). Also shown is the final river water temperature (yellow line) and temperature increase (magenta line). Due to missing flow data at Jersey Point, the mass balance could be performed only in May and August. The year 2000 has flows at Jersey Point fluctuating between positive and negative values. The maximum temperature increase occurs on May 22, 2000 when the flow becomes zero and dilution effects are minimized. During the higher flow periods (mid-May), the final river temperatures are close to the initial river temperature as dilution effects are dominant. The average temperature increase of the mass balance during the April 1 to August 31 period is 2$^{o}$ F. The last 3 criteria of Decision 1643, Condition 20b will not be analyzed due to the large period of missing flow data between early June and early August.

The Bacon Island mass balance is given in Figure 5-23 showing computed water temperatures (red line), observed Old River at Holland Cut temperatures (blue circles), Old River at Bacon Island flows (green line), and Bacon Island discharges (brown triangles). In 2000, Old River at Bacon Island had fairly low flows with most of the values being negative during the April to August period. As is the case with Webb Tract, the highest temperature increases upon discharge (magenta line) occurred during periods of zero flow. The computed average April to August temperature increase is 1.8$^{o}$ F. A summary of the 2000 temperature mass balance is given in Table 5-10.

The last three criteria of Condition 20b will now be applied to the Bacon Island mass balance. On inspection of Figure 5-23, when the Holland Cut water temperatures are between 55$^{o}$ F and 66$^{o}$ F, average temperature increases were lower than 4$^{o}$ F. Although temperatures did exceed 4$^{o}$ F a few instances, especially when Holland Cut flows went to zero, on average, temperature increases were below 4$^{o}$ F. Aside from a short period in early August, when water temperatures were above 77$^{o}$ F, Old River at Holland Cut would remain in the 66$^{o}$ F to 77$^{o}$ F temperature regime. On average temperature increases would be limited to about 2$^{o}$ F, however increases may be more as Holland Cut flows approach zero.

Mass balance plots for Webb Tract and Bacon Island for 1999 are displayed in Figures 5-24 and 5-25. On inspection of Figure 5-24, water temperature at the San Joaquin at

San Andreas Landing (green line) is below 66$^o$ F until late May 1999. During this period, temperature increases (magenta line) are below 4$^o$ F. As water temperatures at San Andreas Landing increase to the 66$^o$ F to 77$^o$ F regime, the average temperature increase, in general, is less than 2$^o$ F. The exception is a brief period in late June when Jersey Point flows approach zero accompanied by an increase in Webb Tract island water temperatures.

The Bacon Island mass balance (Figure 5-25) shows that the water temperature at Old River at Holland Cut remains below 66$^o$ F until late May 1999. It is during this period that channel temperature increases (magenta line) are highest due to low Bacon Island flows (green line). The temperature increase (magenta line) during the 55$^o$ F and 66$^o$ F temperature regime straddles the 4$^o$ F limit and sometimes exceeds it during periods of zero flows. As Holland Cut water temperatures climb to the 55$^o$ F and 66$^o$ F regime, the final channel temperature increases (magenta line) diminish as Old River flows increase (green line) and the water temperature difference between Bacon Island (red line) and Holland Cut (blue circles) decrease. A summary of the 1999 mass balances is given in Table 5-11.

**TABLE 5-10** SUMMARY OF 2000 TEMPERATURE MASS BALANCE

| Statistic | Webb Tract Observed Channel Temp (deg F) | Bacon Is. Observed Channel Temp (deg F) | Webb Tract Computed Channel Final Temp (deg F) | Bacon Is. Computed Channel Final Temp (deg F) | Webb Tract Channel Temp Increase (deg F) | Bacon Is. Channel Temp Increase (deg F) |
|---|---|---|---|---|---|---|
| Maximum (Apr-Aug) | 74.7 | 78.1 | 78.3 | 79.0 | 6.3 | 4.9 |
| Average (Apr-Aug) | 68.3 | 69.9 | 70.8[1] | 71.7 | 2.0[1] | 1.8 |

[1] April –August average of available data, limited by available flow data

The 1998 mass balance for Webb Tract is given in Figure 5-26. As shown in the mass balance plot, flows on the San Joaquin River at Jersey Point (green line) exceed the Webb Tract discharge rate (brown line) of 4000 cfs for most of the time window. Due to the high flows at Jersey Point, temperature increases (magenta line) to the channel are minimized due to high dilution effects. Final water temperatures in the channel (yellow line) are close to the initial temperatures (blue circles). A summary of the 1998 Webb Tract mass balance is given in Table 5-11.

**TABLE 5-11** SUMMARY OF 1999 TEMPERATURE MASS BALANCE

| Statistic | Webb Tract Observed Channel Temp (deg F) | Bacon Is. Observed Channel Temp (deg F) | Webb Tract Computed Channel Final Temp (deg F) | Bacon Is. Computed Channel Final Temp (deg F) | Webb Tract Channel Temp Increase (deg F) | Bacon Is. Channel Temp Increase (deg F) |
|---|---|---|---|---|---|---|
| Maximum (Apr-Aug) | 74.8 | 78.1 | 78.3 | 79.0 | 7.1 | 6.8 |
| Average (Apr-Aug) | 66.4 | 68.2 | 67.2 | 69.4 | 1.0 | 1.2 |

**TABLE 5-12** SUMMARY OF 1998 TEMPERATURE MASS BALANCE

| Statistic | Webb Tract Observed Channel Temp (deg F) | Webb Tract Computed Final Channel Temp (deg F) | Webb Tract Channel Temp Increase (deg F) |
|---|---|---|---|
| Maximum (Apr-Jul 22) | 77.3 | 77.8 | 1.0 |
| Average (Apr-Jul 22) | 65.9 | 65.9 | 0.4 |

It should be noted that the mass balances conducted in this study are based on daily averaged values. Temperature exceedances may occur at a greater frequency if computations are performed with a finer time step.

### 5.7 Analysis of Observed Dissolved Oxygen Data

An analysis of observed dissolved oxygen data was conducted to provide a range of DO concentrations in the Delta and to establish upper and lower bounds. The years 2000, 1999, and 1998 were analyzed. Dissolved oxygen stations are displayed in Figure 5-27 and summarized in Table 5-13. Stations that record dissolved oxygen are less abundant than water temperature stations, and continuous recording stations are especially scarce. The closest dissolved oxygen station to Webb Tract is the San Joaquin River at Antioch. This is a continuous recording station that has been operational since May 1983. Intermittent DO readings are also taken at Twitchell Agricultural Drain to the west of Webb Tract. Bacon Island has intermittent DO readings taken at the Old River at Bacon Island and also at the Bacon Agricultural Drain, but has no continuous recording stations in its vicinity. Dissolved oxygen concentrations from the Stockton Ship Canal were also analyzed. The warm water temperatures and stagnant flows of the Stockton Ship Canal produce low DO concentrations that can serve as a lower bound along with the agricultural drains. The Stockton Ship Canal with its great depth (mean depth 22 ft), high turbidity and steep slopes also deters aquatic plant production thereby hindering photosynthetic oxygen generation. Only a narrow band of water near the surface receives enough light to support suspended algal photosynthesis (Jones and Stokes Associates, 1998).

**TABLE 5-13** DELTA DISSOLVED OXYGEN STATIONS

| Station Name | Database Source | Frequency of Data Collection | Period of Record |
|---|---|---|---|
| San Joaquin at Antioch | IEP | Hourly | May 1983 – Jun 2001 |
| Old River at Bacon Island | WDL | Intermittent | Nov 1994 – Mar 2001 |
| Twitchell Agricultural Drain | WDL | Intermittent | Jul 1989 – Mar 2001 |
| Bacon Agricultural Drain | WDL | Intermittent | Jan 1990 – Nov 2000 |
| Clifton Court Forebay Inflow | WDL | Intermittent | Jan 1984 - Oct 1994, Feb 1998 - Dec 2000 |
| Stockton Ship Canal | IEP | Hourly | May 1983 – Sep 2001 |

Plots of observed dissolved oxygen data are given in Figures 5-28 to 5-30. The plots are based on hourly DO readings for the continuous stations, and the recorded DO and times for spot readings. Figure 5-28 shows the year 2000 DO concentrations at Antioch (red line), Old River at Bacon Island (magenta squares), Clifton Court Forebay intake (blue circles), Twitchell Ag Drain (yellow triangles), Bacon Ag Drain (brown Xs), and the Stockton Ship Canal (orange line). The red line signifies the 6 mg/l exceedance limit as specified by Condition 19a of Decision 1643. For the year 2000, the DO concentrations of Antioch, Clifton Court Forebay, and Old River at Bacon Island appear to follow the same trend ranging from a high DO concentration of about 12 mg/l to a low concentration of 7.5 mg/l. The DO concentrations are higher in the winter when cooler water temperatures increase the saturation concentration of dissolved oxygen in water. Cooler water temperatures also inhibit microbial activity, thereby lowering BOD loads, and it also slows other chemical reactions dependent on temperature. The reverse occurs in the summer when higher water temperatures reduce the DO saturation concentration, increase microbial activity and speed reaction rates, thereby lowering the overall DO concentration.

The Stockton Ship Canal experienced low levels of DO (about 4 mg/l) early in winter, but recovered to about 10 mg/l in late April. By mid summer, DO concentrations in the Ship Canal decreased as low as 3 mg/l in mid summer before increasing with declining water temperatures in the fall. Occasional high spikes of DO concentrations were encountered with a maximum DO reading of 14.8 mg/l being recorded in the early evening of September 8, 2000. The exact cause of the spikes is unknown, but it could be due to a high level of algal mass flowing in from Mossdale. A temporary high influx of algal biomass could supersaturate DO concentrations before it settles out of the euphotic (lighted penetrating) zone and begins decomposing in the water column and channel bottom causing an increase to the BOD load. As seen in Figure 5-28, the behavior of DO in the ship canal is unlike that at Antioch, Old River at Bacon Island and Clifton Court.

The agricultural drains at Twitchell and Bacon Island vary in DO concentration from about 7 mg/l to a low of 1.64 mg/l at Bacon Island on November 11, 2000. The agricultural drain data follows no real trend, which is even more apparent in the years 1999 and 1998. In 2000, the average DO concentration of the Twitchell and Bacon Island agricultural drains is about 5 to 6 mg/l.

In 1999 (Figure 5-29) the DO concentrations at Antioch, Old River at Bacon Island and Clifton Court Intake are again fairly similar. DO concentrations vary from about 12 to 7.5 mg/l. The Stockton Ship Canal begins the year with DO concentrations about 10 mg/l and steadily decreases through the summer reaching a low of 1.8 mg/l in early October 1999. Bacon agricultural drain data appears scattered jumping from a high value of 9.5 mg/l on August 4 to a low value of 3.5 on September 7. Ignoring the first data point, Twitchell Ag Drain appears to start the year around 11 mg/l before dropping to 4 mg/l to 5 mg/l by mid-year and holding there until year’s end.

In 1998, (Figure 5-29) the DO concentrations at Antioch and the Stockton Ship Canal are fairly similar until mid-year. This can be attributed to the high flows that occurred on the San Joaquin River that year. Old River at Bacon Island DO concentrations are similar to 2000 and 1999, varying between 11 mg/l to 7.5 mg/l. Clifton Court Forebay intake appears to follow the same trend as Antioch. The Stockton Ship Canal falls below 6 mg/l DO for a brief period between mid-August and mid-September. Bacon and Twitchell agricultural drain DO concentration average about 5 to 6 mg/l through the year.

**5.8 The Island Dissolved Oxygen Algorithm**

An island dissolved oxygen model was developed to study the DO impacts between the flooded islands and the adjacent river channel. The island dissolved oxygen model was written in Excel and was linked to the island water temperature model. The island dissolved oxygen algorithm uses daily computed water temperatures and daily averaged observed wind speed data, and is based on a daily time step. As in the temperature model, it assumes complete mixing within flooded islands, thus concentration gradients of dissolved oxygen will not be considered in this study. Like in temperature modeling, simulating stratification of dissolved oxygen is not practical without profile data for calibration and verification purposes. The model was developed to directly utilize DO data taken from peat soil tank experiments conducted by the Municipal Water Quality Investigations (MWQI) program. In addition, due to the preliminary level of this study, the modeling of algae photosynthesis and respiration was simplified. A more detailed analysis of phytoplankton dynamics would require further analysis in coordination with the bioproductivity studies being conducted for the In-Delta Storage Project.

The dissolved oxygen algorithm is based on the fundamental components of the DO balance equation. The components are displayed in Figure 5-31 and the DO balance is given by:

$$DO = DO_{sat} + R - S + A$$

Where:

- DO = the DO concentration at the current time step
- $DO_{sat}$ = is the DO saturation concentration for a given water temperature
- R = is the DO gained from reaeration
- S = is the oxygen sag in the water column and sediments
- A = is the net oxygen gain or loss from phytoplankton and aquatic plants due to photosynthesis and respiration

DO is in units in mg/l/day

The oxygen sag term (S) in the DO balance is a lumped term and represents the interactions of many different elements. Figure 5-31 displays the sources and sinks of oxygen in a water body. Sources of oxygen in an enclosed reservoir system include reaeration at the air-water interface and phytoplankton photosynthesis. Oxygen sinks include phytoplankton respiration, labile and refractory dissolved organic matter, the decomposition of detritus, sediment oxygen demand (SOD), and the oxidation of sulfides, reduced metals and ammonia nitrogen. Dissolved oxygen modeling simulates the complex dynamics of temperature, sunlight, wind, aquatic life forms (plants, animals and microbes), nutrients, dissolved and suspended organic matter, and the interaction between the water column and sediments. Modeling the dynamics of just one component of the oxygen balance can be complicated in itself, and may require an abundance of field data to properly represent the system. For example, modeling phytoplankton dynamics requires the knowledge of algae growth rate, respiration rate, mortality rate, and settling rate. The algae growth rate is a function of nutrient availability (carbon, nitrogen, phosphorus, etc), light intensity and light penetration. Algae mortality rate involves population size, substrate supply, and predation.

The first component of the DO balance is the dissolved oxygen saturation concentration. DO saturation is a function of water temperature and salinity. Dissolved oxygen saturation for fresh water can be computed through:

$$\ln DO_{sf} = -139.34411 + \frac{1.575701 x 10^{5}}{T_a} - \frac{6.642308 x 10^{7}}{T_a^{2}} + \frac{1.243800 x 10^{10}}{T_a^{3}} - \frac{8.621949 x 10^{11}}{T_a^{4}}$$

Where:

$DO_{sf}$= Saturated dissolved oxygen concentration in fresh water

$T_a$ = Temperature of the air (K)

A correction for salinity can be obtained through:

$$\ln DO_{ss} = \ln DO_{Sf} - 0.00064 S\left(1.7674 x 10^{-2} - \frac{1.0754 x 10^{1}}{Ta} + \frac{2.1407 x 10^{3}}{Ta^{2}}\right)$$

Where:

$DO_{ss}$= Saturated dissolved oxygen concentration with salinity

S = salinity concentration (µS/cm)

Reaeration is a function of the reaeration coefficient and the gradient between the DO saturation concentration and the actual DO concentration.

$$R_t = K(DO_S - DO)$$

Where:

R= DO gain through reaeration

K = reaeration coefficient (day-1)

$DO_s$ = Saturated dissolved oxygen concentration

DO = Actual dissolved oxygen concentration.

The reaeration coefficient equation used is commonly found in several reservoir water quality models including HEC-5Q, WQRRS and CE-QUAL-W2. It is a function of wind speed and depth and is given by:

$$K_{20} = \frac{0.64 + 0.032\ Uw^{2}}{d}$$

Where:

$K_{20}$= Reaeration coefficient at 20$^{o}$ C
$U_w$=Wind Velocity in m/s
d =water depth in meters

The reaeration coefficient above is for 20$^{o}$ C and most be corrected for the current water temperature.

$$K_T = K_{20}\,\theta^{(T-20)}$$

Where:

$K_T$ = Reaeration coefficient at T degrees
$K_{20}$= Reaeration coefficient at 20$^{o}$ C
$\Theta$ = 1.024
T = Temperature of the water in $^{o}$ C

The lumped oxygen sag term (S) incorporates all the oxygen demand in the water column and sediments with the exception of phytoplankton respiration. The lumped term was used to take advantage of peat soil tank experiments conducted at the MWQI SMARTS (Special Multipurpose Applied Research and Technology Station) lab facility. The SMARTS tank experiments (Figure 5-32) involved the collection of peat soil at Twitchell Island. The peat soil was placed in eight tanks at two different depths: 1.5 or 4 feet. The tanks were flooded to two different depths (2 or 7 feet) and had two water exchange rates (none or 1.5 times per week). The ninth tank was a control tank that contained no soil, was flooded to a depth of 11 feet, and had no water exchange. The tanks were covered to inhibit algae and plant growth and numerous water quality readings (including DO) were taken over the period January 13, 1999 to January 21, 2000. Although the tanks were covered with tarps, the water did receive oxygen as was evidenced by the control tank, which was consistently at the saturated DO concentration. Data from two tanks were investigated for the DO analysis: Tank 5 and Tank 7. Tanks 5 and 7 were both flooded to the maximum depth of 7 feet and had no water exchange. Tank 5 had a depth of peat soil of 4 feet and Tank 7 had a peat soil depth of 1.5 feet. It was determined through the experimental data that Tank 5 had a dissolved organic carbon (DOC) content of 15 mg/l while Tank 7 had a DOC concentration of 22 mg/l. It was decided to use the data from both tanks as they would provide a high and low value for DOC concentration and dissolved oxygen demand.

Plots of dissolved oxygen concentration versus water temperature were developed and a best fit curve was generated from the experimental data (Figures 5-33 and 5-34). According to the best-fit curve, the DO concentration in Tank 5 will vary from about 8.5 mg/l when the water temperature is $50^{o}$ F to about 3.5 mg/l when the temperature is $80^{o}$ F. Tank 7 had a much greater rate of DO consumption. The DO concentration in Tank 7 varied from 6.2 mg/l at $50^{o}$ F to 1.1 mg/l at $80^{o}$ F. For this study, it was assumed that the tank experiments incorporated all the oxygen demand in the water column and sediments with the exception of algae respiration. The lumped oxygen sag term (S) can be determined by computing the DO concentration for a given water temperature from the best fit curve and subtracting it from the saturation DO concentration.

$$S = DO_{sat} - DO_{\tan k}$$

The last component of the DO balance is the algal term (A). The oxygen generated by phytoplankton photosynthesis and consumed by phytoplankton respiration can be determined through:

$$A = \alpha_1 \mu [C] - \alpha_2 \rho [C]$$

Where:

- A = DO generated or consumed by algae (mg/l/day)
- [C] = phytoplankton concentration in mg/l Carbon
- $\alpha_1$ = amount of oxygen generated per unit of phytoplankton photosynthesis = 1.6
- $\mu$ = phytoplankton growth rate at the ambient temperature ($day^{-1}$)
- $\alpha_2$ = amount of oxygen consumed per unit of phytoplankton respired = 2.0
- $\rho$ = phytoplankton respiration rate at the ambient temperature = 0.15 $day^{-1}$

The equation above is the algal DO component found in DSM2 and EPA QUAL2E. In the model HEC-5Q, there is also a term for phytoplankton mortality rate. However, in DSM2 and QUAL2E, the mortality rate is combined with the respiration term $\alpha_2$. When given a known algal concentration in mg/l Carbon, and using the default values for $\alpha_1$, $\alpha_2$, and $\rho$, the only unknown in the preceding equation is the phytoplankton growth rate. The growth rate is a complicated relationship between nutrient concentrations, light intensity and light penetration. With a lack of measured phytoplankton field data, the algal growth rate ($\mu$ ) is simply a parameter used to calibrate computed DO concentrations with observed DO concentrations.

Estimates of phytoplankton concentrations were provided by bioproductivity studies of the In-Delta Storage Project. The phytoplankton concentrations were provided in the form of curves of algae concentration versus Julian day. The phytoplankton curves are displayed in Figure 5-35 and give daily concentrations of carbon for low (10 $mg/m^3$ or 10 $\mu g/l$), medium (20 $mg/m^3$ or 20 $\mu g/l$) and high chlorophyll (50 $mg/m^3$ or 50 $\mu g/l$) levels.

The phytoplankton curves were applied to Algae DO equation using a growth rate ($\mu$) of 0.7. The final DO concentration for Webb Tract for the year 2000 was computed through the DO balance and the results are shown in Figure 5-36. The plot in Figure 5-36 assumed a Tank 5 oxygen demand and displays the DO concentrations for the case of no algae and low, medium and high algal levels. The DO concentrations vary from 9 mg/l to 4 mg/l for the no algae case to about 20 mg/l to 25 mg/l for the high algal case. Dissolved Oxygen for the low algal case borders on saturation concentration (11 mg/l-8mg/l) while the medium and high algal levels are supersaturated. Note that DO concentrations can be much higher if the phytoplankton growth rate is increased, or lower if the growth rate is decreased.

## 5.9 Dissolved Oxygen Model Results

Dissolved oxygen modeling was conducted on Webb Tract and Bacon Island for the years 2000 and 1999 and for Webb Tract in 1998. Filling operations for the reservoir islands are the same as in the temperature modeling (Figure 5-11). The dissolved oxygen stations used to represent the channel adjacent to the island are given in Table 5-14.

**TABLE 5-14** DISSOLVED OXYGEN STATION ASSIGNMENTS

| Webb Tract | Period Used | Bacon Island | Period Used |
|---|---|---|---|
| San Joaquin at Antioch | (1998-2000) | Old River at Bacon Island | (1999-2000) |

### 5.9.1 Verification Against Year 2000 Data

Results of the dissolved oxygen algorithm were compared to observed DO measurements from the year 2000. The stations analyzed were Clifton Court Forebay Intake, Old River at Bacon Island, the San Joaquin River at Antioch, the Stockton Ship Canal, and the agricultural drains at Twitchell Island and Bacon Island. The following assumptions were made in the verification exercise:

1. The DO model was assigned an oxygen demand from SMARTS Experiment Tank 5
2. The two phytoplankton conditions analyzed would be no algae and low algae
3. Computed DO concentrations for Webb Tract would be adjusted to match Clifton Court Forebay intake and the San Joaquin River at Antioch using Tank 5 oxygen demand and low algae levels (10 $mg/m^3$ of Chlorophyll).
4. Computed DO concentrations for Bacon Island would be adjusted to match Clifton Court Forebay intake and the Old River at Bacon Island using Tank 5 oxygen demand and low algae levels (10 $mg/m^3$ of Chlorophyll).
5. DO concentration drops due to sudden algae die off would not be modeled.

Adjustments were made to the algal growth rate parameter ($\mu$) until the computed DO compared favorably with the observed DO. The assumption of which SMARTS tank and algal level to use and what DO station to compare against was based entirely on engineering judgment. Due to a lack of actual DO calibration data for a flooded reservoir island, the results of the DO analysis should be considered preliminary. Additional studies should be conducted to more accurately model the oxygen demand due to organic loading and to model the phytoplankton dynamics of the system.

The results of the DO model for Webb Tract are shown Figure 5-37. Shown on the plot is computed DO for the no algae case (blue line) and low algae case (light blue squares), and observed DO for Antioch (red circles), Clifton Court (purple triangles), Stockton Ship Canal (orange crosses, daily averaged values) and Twitchell Ag Drain (magenta ∗s). The algal growth rate was adjusted until computed Webb Tract DO concentrations closely matched the observed DO concentrations at Antioch and Clifton Court Forebay. The computed DO concentrations for the low algae case ranged from about 11 to 7.5 mg/l and compared favorably to Antioch and Clifton Court. Concentrations of dissolved oxygen are well above the 6 mg/l limit as specified in Condition 19a of Decision 1643. The DO concentration of the no algae case varied from 9 mg/l to 4 mg/l. The low DO concentration of 4 mg/l of the no algae case is consistent with the low DO concentrations of Twitchell Ag Drain and the Stockton Ship Canal. Exceedances of the 6 mg/l limit occur sporadically from late March to early May before finally dropping below 6 mg/l and remaining there until mid October.

Figure 5-38 shows the computed DO concentrations for Bacon Island. Using the same algal growth rate as used in Webb Tract, computed DO concentrations for the low algal case (light blue squares) compared favorably with Clifton Court Forebay (purple triangles) and Old River at Bacon Island (red circles). For the low algal case, the DO concentrations at Bacon Island range from about 11.5 mg/l to 7.5 mg/l and remain above the 6 mg/l limit. The low DO concentrations of the no algae case (blue line) are consistent with the low DO concentrations of the Stockton Ship Canal (orange crosses).

Figures 5-39 and 5-40 show the computed DO concentration using the same algal growth rate, but now using Tank 7 oxygen demand. The two plots are similar in appearance. The DO concentrations at both Webb Tract and Bacon Island decreased and now range from about 10 mg/l to 5.5 mg/l for the low algal case. The 6 mg/l limit is violated briefly in mid August and then again from early September to early October. The no algae case violates the 6 mg/l limit in early March and remains in exceedance until late November.

### 5.9.2 Summary of Dissolved Oxygen Modeling Results

Plots of computed DO for Tanks 5 and 7, and no algae and low algal levels, were developed for Webb Tract and Bacon Island in 1999, and just for Webb Tract in 1998. The plots can be found in Appendix 5A in Figures 5A-1 to 5A-6. A summary of the DO plots is given in Tables 5-15 to 5-20. According to Condition 19a of Decision 1643:

*Permittee shall not discharge water from the reservoir islands if the water discharged has a dissolved oxygen level of less than 6.0 mg/l or would depress the dissolved oxygen level in the adjacent channel of the Delta to less than 5.0 mg/l, or would depress* *the dissolved oxygen level in the reach of the San Joaquin River between Turner Cut and Stockton to less than 6.0 mg/l during September through November.*

For the purpose of this study, the case of Tank 5 oxygen demand and low algal levels can serve as upper bounds for DO concentrations. The case of Tank 7 oxygen demand and no algae conditions can serve as a lower DO bounds. According to the summary tables, exceedances of the 6 mg/l limit for the Delta Island DO will occur most frequently for high organic loadings (Tank 7) and no algae growth. As algal growth increases, dissolved oxygen concentrations will also increase. However, this analysis does not account for massive algal die off which may occur for a variety of reasons including a decrease in nutrients, introduction of toxins, a change in the environment, or a shift in water chemistry. A massive die off would lead to an increase in organic loading and a decrease in dissolved oxygen.

Be aware that the results of the DO analysis are based on daily averaged values. During a 24- hour period, DO concentrations associated with phytoplankton will undergo diurnal swings as photosynthesis occurs during the day and respiration during the night. The amplitude of the swings depends on the level of algae growth. Higher levels of algae will generate more oxygen during the day, but will also respire more during the night as opposed to lower levels of algae. Therefore, it is possible that significant drops in DO concentration will occur during the night depending on algae concentrations. A daily time step model will not account for the diurnal fluctuations in DO and more exceedances to Condition 19a may occur with a finer time step.

**TABLE 5-15** SUMMARY OF 2000 DO CONCENTRATION (TANK 5)

| Statistic | Webb Tract Computed DO (mg/l) No Algae | Bacon Island Computed DO (mg/l) No Algae | Webb Tract Computed DO (mg/l) Low Algae | Bacon Island Computed DO(mg/l) Low Algae |
|---|---|---|---|---|
| Minimum (Jan-Dec) | 4.0 | 4.0 | 7.6 | 7.6 |
| Average (Jan-Dec) | 6.5 | 6.5 | 9.6 | 9.6 |
| Average (Apr-Aug) | 5.2 | 5.1 | 8.7 | 8.8 |
| Average (Jun-Aug) | 4.8 | 4.7 | 8.4 | 8.5 |

**TABLE 5-16** SUMMARY OF 2000 DO CONCENTRATION (TANK 7)

| Statistic | Webb Tract Computed DO (mg/l) No Algae | Bacon Island Computed DO (mg/l) No Algae | Webb Tract Computed DO (mg/l) Low Algae | Bacon Island Computed DO(mg/l) Low Algae |
|---|---|---|---|---|
| Minimum (Jan-Dec) | 2.1 | 2.1 | 5.5 | 5.5 |
| Average (Jan-Dec) | 4.4 | 4.3 | 7.5 | 7.4 |
| Average (Apr-Aug) | 3.0 | 2.9 | 6.6 | 6.5 |
| Average (Jun-Aug) | 2.7 | 2.7 | 6.5 | 6.4 |

**TABLE 5-17** SUMMARY OF 1999 DO CONCENTRATION (TANK 5)

| Statistic | Webb Tract Computed DO (mg/l) No Algae | Bacon Island Computed DO (mg/l) No Algae | Webb Tract Computed DO (mg/l) Low Algae | Bacon Island Computed DO(mg/l) Low Algae |
|---|---|---|---|---|
| Minimum (Jan-Dec) | 3.9 | 3.9 | 7.8 | 7.9 |
| Average (Jan-Dec) | 6.7 | 6.7 | 9.8 | 9.8 |
| Average (Apr-Aug) | 5.7 | 5.6 | 9.3 | 9.1 |
| Average (Jun-Aug) | 5.3 | 5.2 | 9.0 | 8.9 |

**TABLE 5-18** SUMMARY OF 1999 DO CONCENTRATION (TANK 7)

| Statistic | Webb Tract Computed DO (mg/l) No Algae | Bacon Island Computed DO (mg/l) No Algae | Webb Tract Computed DO (mg/l) Low Algae | Bacon Island Computed DO(mg/l) Low Algae |
|---|---|---|---|---|
| Minimum (Jan-Dec) | 1.9 | 1.9 | 5.5 | 5.6 |
| Average (Jan-Dec) | 4.5 | 4.5 | 7.6 | 7.6 |
| Average (Apr-Aug) | 3.5 | 3.4 | 7.0 | 6.9 |
| Average (Jun-Aug) | 3.1 | 3.1 | 6.8 | 6.8 |

**TABLE 5-19** SUMMARY OF 1998 WEBB TRACT DO CONCENTRATION (TANK 5)

| Statistic | Webb Tract Computed DO (mg/l) No Algae | Webb Tract Computed DO (mg/l) Low Algae |
|---|---|---|
| Minimum (Jan-Dec) | 3.8 | 7.3 |
| Average (Jan-Dec) | 6.6 | 9.7 |
| Average (Apr-Aug) | 5.3 | 9.0 |
| Average (Jun-Aug) | 4.9 | 8.6 |

**TABLE 5-20** SUMMARY OF 1998 WEBB TRACT DO CONCENTRATION (TANK7)

| Statistic | Webb Tract Computed DO (mg/l) No Algae | Webb Tract Computed DO (mg/l) Low Algae |
|---|---|---|
| Minimum (Jan-Dec) | 1.9 | 5.4 |
| Average (Jan-Dec) | 4.4 | 7.5 |
| Average (Apr-Aug) | 3.0 | 6.7 |
| Average (Jun-Aug) | 2.8 | 6.5 |

### 5.9.3 Summary of Dissolved Oxygen Mass Balance Results

Mass balances were conducted to determine DO impacts due to discharging island water back to the channel. Webb Tract and Bacon Island were analyzed for 2000 and 1999, and only Webb Tract in 1998. Like the temperature mass balance, computations were performed for the period April 1 to August 31. The discharge rate for the mass balance was assumed to be 4000 cfs.

Figure 5-41 shows the mass balance plot for Webb Tract for the year 2000, assuming Tank 5 oxygen demand and no algae. Shown on the mass balance plot is the computed Webb Tract DO concentration (light blue triangles), San Joaquin at Antioch DO (blue circles), Webb Tract discharges (brown triangles), San Joaquin at Jersey Point flows (green line), and the final river DO (magenta diamonds). The red line represents the 5 mg/l channel exceedance limit defined in Condition 19a. Due to missing flow data at Jersey Point, the mass balance could be performed only in May and August. As demonstrated in the temperature mass balance, the greatest impacts to the channel occur when the flow reverses and becomes zero. In the low algae case (Figure 5-42), the presence of phytoplankton has elevated island DO concentrations comparable to river levels. Impacts to river DO concentrations, for this case, are negligible regardless of the flow level.

Similar mass balance plots were created for Webb Tract using Tank 7 oxygen demand and no algae (Figure 5-43) and low algae (Figure 5-44). In the no algae case, the computed island DO is below the 5 mg/l exceedance limit for the entire time window. For this reason, exceedances to the final channel DO concentration are shown to occur more frequently than in the Tank 5, no algae case. In the Tank 7, low algae case, the spread between the island and river DO is more pronounced than in the Tank 5 case. However, exceedances do not occur until early August when the island DO falls below the 6 mg/l limit.

The mass balance plots for Bacon Island for the year 2000 are given in Figures 5-45 to 5-48. Due to a lack of a continuous recording DO station near Bacon Island, the mass balance plot is limited to a few points. However, the plots are still shown for completeness. They same trends that were seen at Webb Tract are also seen at Bacon Island. Mass balance plots for Webb Tract and Bacon Island for 1999 are presented in Figures 5A-7 to 5A-14 in Appendix 5A. The mass balance for Webb Tract for 1988 is given in Figures 5A-15 to 5A-18 in the appendix. A summary of the mass balance results is given in Tables 5-21 to 5-26 for Webb Tract. Bacon Island results are not summarized due to a lack of data points.

Determining whether the DO level in the channel would be depressed below 5 mg/l can be analyzed by a mass balance. The issue on impacting the DO concentrations between Turner Cut and Stockton is beyond the application of a mass balance. It can be assumed that if the final DO concentration is above 6 mg/l in the channel, and flows are high, the project will have no impact between Turner Cut and Stockton. Such will be the case at Webb Tract, when channel DO concentrations are above 6 mg/l, and flows on the San Joaquin River significantly exceed the discharges from the reservoir islands. The issue becomes more complicated when flows are low on the San Joaquin River and reverse tidal flows occur. Bacon Island is even more complicated, due to the reverse flows that commonly occur, and the complex system of sloughs that the flows must navigate before reaching the San Joaquin River. In general, when flows are low and final DO concentrations upon discharge are between 5 to 6 mg/l, a more sophisticated river network model like DSM2 should be applied. However, such a model will first need to be calibrated for DO for the Delta island region.

**TABLE 5-21** SUMMARY OF 2000 DO MASS BALANCE FOR WEBB TRACT TANK 5 OXYGEN DEMAND

| Statistic | Webb Tract Observed Channel DO (mg/l) | Webb Tract Comp. Island DO (mg/l) (No Algae) | Webb Tract Comp. Channel Final DO (mg/l) (No Algae) | Webb Tract Comp. Island DO (mg/l) (Low Algae) | Webb Tract Comp. Channel Final DO (mg/l) (Low Algae) |
|---|---|---|---|---|---|
| Minimum (Apr-Aug) | 7.5 | 4.0 | 4.6 | 7.6 | 7.6 |
| Average (Apr-Aug) | 8.4 | 5.2 | 6.8[1] | 8.7 | 8.5[1] |
| Average (Jun-Aug) | 8.1 | 4.8 | 6.2[2] | 8.4 | 8.1[2] |

[1] April –August average of available data, limited by available flow data
[2] June –August average of available data, limited by available flow data

**TABLE 5-22** SUMMARY OF 2000 DO MASS BALANCE FOR WEBB TRACT TANK 7 OXYGEN DEMAND

| Statistic | Webb Tract Observed Channel DO (mg/l) | Webb Tract Comp. Island DO (mg/l) (No Algae) | Webb Tract Comp. Channel Final DO (mg/l) (No Algae) | Webb Tract Comp. Island DO (mg/l) (Low Algae) | Webb Tract Comp. Channel Final DO (mg/l) (Low Algae) |
|---|---|---|---|---|---|
| Minimum (Apr-Aug) | 7.5 | 2.1 | 2.4 | 5.5 | 6.2 |
| Average (Apr-Aug) | 8.4 | 3.0 | 5.7[1] | 6.6 | 7.5[1] |
| Average (Jun-Aug) | 8.1 | 2.7 | 5.2[2] | 6.5 | 7.0[2] |

[1] April –August average of available data, limited by available flow data
[2] June –August average of available data, limited by available flow data

**TABLE 5-23** SUMMARY OF 1999 DO MASS BALANCE FOR WEBB TRACT TANK 5 OXYGEN DEMAND

| Statistic | Webb Tract Observed Channel DO (mg/l) | Webb Tract Comp. Island DO (mg/l) (No Algae) | Webb Tract Comp. Channel Final DO (mg/l) (No Algae) | Webb Tract Comp. Island DO (mg/l) (Low Algae) | Webb Tract Comp. Channel Final DO (mg/l) (Low Algae) |
|---|---|---|---|---|---|
| Minimum (Apr-Aug) | 7.3 | 3.9 | 4.8 | 7.8 | 7.7 |
| Average (Apr-Aug) | 8.6 | 5.7 | 7.2[1] | 9.3 | 9.0[1] |
| Average (Jun-Aug) | 8.1 | 5.3 | 6.4[2] | 9.0 | 8.5[2] |

[1] April –August average of available data, limited by available DO data
[2] June –August average of available data, limited by available DO data

**TABLE 5-24** SUMMARY OF 1999 DO MASS BALANCE FOR WEBB TRACT TANK 7 OXYGEN DEMAND

| Statistic | Webb Tract Observed Channel DO (mg/l) | Webb Tract Comp. Island DO (mg/l) (No Algae) | Webb Tract Comp. Channel Final DO (mg/l) (No Algae) | Webb Tract Comp. Island DO (mg/l) (Low Algae) | Webb Tract Comp. Channel Final DO (mg/l) (Low Algae) |
|---|---|---|---|---|---|
| Minimum (Apr-Aug) | 7.3 | 1.9 | 3.0 | 5.5 | 6.1 |
| Average (Apr-Aug) | 8.6 | 3.5 | 6.1[1] | 7.0 | 7.8[1] |
| Average (Jun-Aug) | 8.1 | 3.1 | 5.1[2] | 6.8 | 7.3[2] |

[1] April –August average of available data, limited by available DO data
[2] June –August average of available data, limited by available DO data

**TABLE 5-25** SUMMARY OF 1998 DO MASS BALANCE FOR WEBB TRACT TANK 5 OXYGEN DEMAND

| Statistic | Webb Tract Observed Channel DO (mg/l) | Webb Tract Comp. Island DO (mg/l) (No Algae) | Webb Tract Comp. Channel Final DO (mg/l) (No Algae) | Webb Tract Comp. Island DO (mg/l) (Low Algae) | Webb Tract Comp. Channel Final DO (mg/l) (Low Algae) |
|---|---|---|---|---|---|
| Minimum (Apr-Aug) | 7.2 | 3.8 | 5.0 | 7.3 | 7.5 |
| Average (Apr-Aug) | 8.3 | 5.3 | 7.5[1] | 9.0 | 8.4[1] |
| Average (Jun-Aug) | 7.7 | 4.9 | 6.6[2] | 8.6 | 7.9[2] |

[1] April –August average of available data, limited by available DO data
[2] June –August average of available data, limited by available DO data

**TABLE 5-26** SUMMARY OF 1998 DO MASS BALANCE FOR WEBB TRACT TANK 7 OXYGEN DEMAND

| Statistic | Webb Tract Observed Channel DO (mg/l) | Webb Tract Comp. Island DO (mg/l) (No Algae) | Webb Tract Comp. Channel Final DO (mg/l) (No Algae) | Webb Tract Comp. Island DO (mg/l) (Low Algae) | Webb Tract Comp. Channel Final DO (mg/l) (Low Algae) |
|---|---|---|---|---|---|
| Minimum (Apr-Aug) | 7.2 | 1.9 | 3.6 | 5.4 | 6.3 |
| Average (Apr-Aug) | 8.3 | 3.0 | 7.0[1] | 6.7 | 7.9[1] |
| Average (Jun-Aug) | 7.7 | 2.8 | 5.9[2] | 6.5 | 7.2[2] |

[1] April –August average of available data, limited by available DO data
[2] June –August average of available data, limited by available DO data

## 5.10 Conclusions and Recommendations

Water temperature and dissolved oxygen was analyzed at Bacon Island and Webb Tract to determine the environmental impacts of the In-Delta Storage Project. Water temperature and DO requirements for the In-Delta Storage project are specified in State Water Resources Control Board Decision 1643. The analysis was conducted by examining observed data and performing water temperature and dissolved oxygen modeling. The modeling was conducted with a daily timestep using daily averaged meteorological, flow and water quality data. Results of this study indicated:

1. An analysis of the 1998-2001 observed data did not show a 20$^o$ F difference between any of the water temperature stations investigated. The data at the stations investigated were hourly and also instantaneous spot readings. Exceedances of Condition 20b (i) did not seem likely to occur for this time period.

2. The computer modeling did not show a 20$^o$ F difference between the computed island water temperature and the water temperature of the closest channel recording station. The years examined were 1998-2001. Again, exceedances of Condition 20b (i) did not seem likely to occur for this time period.

3. The heat budget model indicated that for the years 1998-2001, the water temperature difference between the storage islands and the channel ranged from 1$^o$ F to 9$^o$ F. Higher temperature differences could lead to potential exceedances of Condition 20b (ii. – iv.) depending on flow conditions in the channel. The water temperature differences were based on daily averaged values.

4. An analysis of observed dissolved oxygen data from 1998-2000 showed that DO concentrations are lowest during the summer when water temperatures are the highest. The data at the stations investigated were hourly and also instantaneous spot readings. Exceedances to Condition 19a are most likely to occur in the summer.

5. The dissolved oxygen model was based on oxygen demand data from the SMARTS peat soil tank experiments. The model showed that DO concentration, based on the SMARTS data, 1998-2000 meteorological data, and the lack of algae photosynthesis, could drop well below the 6 mg/l exceedance limit of Condition 19a. The addition of phytoplankton could increase DO levels, but the exact increase is unknown until further algae studies are conducted.

6. The temperature and DO mass balances showed that impacts to channel water temperature and DO are highly dependent on channel flow. Higher channel flows will increase the dilution effects and offset any temperature and DO increases due to discharging from the islands. Dilution is more likely to occur at Webb Tract where higher channel flows occur more frequently on the San Joaquin River. Flows on the Old River near Bacon Island are much lower and often reverse direction for much of the year as observed in the 1998-2000 flow data. Channel water temperature exceedances due to island discharge are specified in Condition 20b (ii. – iv.) and 19a.

7. Temperature and DO exceedances to Condition 20b (ii. – iv.) and 19a are most likely to occur during flow reversals when the net flow in the channel goes to zero.

The results this report are not intended to be final and conclusive, but rather it should provide insight on the temperature and DO behavior within the island system and the possibility of exceedances to Conditions 20b and 19a of SWRCB Decision 1643. Additional studies should be conducted in the following areas:

1. A more thorough analysis to model the algae dynamics of the system. This would involve field studies and detailed modeling work with more advanced numerical water quality models.

2. The issue on impacting the DO concentrations between Turner Cut and Stockton is beyond the application of a mass balance. When flows are low and final DO concentrations upon discharge are between 5 to 6 mg/l, a more sophisticated river network model like DSM2 should be applied. However, such a model will first need to be calibrated for DO for the Delta island region.

3. Profile data of water temperature and dissolved oxygen from a flooded Delta island should be collected over a year or more if the issue of stratification is of interest.

4. It did not appear that the difference in water temperature between the island and channel would exceed $20^{o}$ F (Condition 20b i.) in a normal weather year. A critical weather year, with abnormally high air temperatures, should also be examined. It may be necessary to purchase the meteorological data from NOAA before this can be undertaken. A heat budget analysis is extremely data intensive and the period of record analyzed is dependent on available meteorological data.

## 5.11 References

California Department of Water Resources (2001), *In-Delta Storage Program Description of Alternatives*, Draft memo, Sacramento, CA

California Department of Water Resources (1998), *DSM2 Equations for Non Conservative Constituents*, 1998 Annual Report, DWR Website, Sacramento, CA

Chapra, Steven C. (1997*), Surface Water Quality Modeling*, McGraw-Hill, Inc.

Cole, Thomas M., Wells Scott A. (2000*), CE-QUAL-W2: A Two Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.0 User Manual*, Prepared for the US Army Corps of Engineers, Washington DC.

Danish Hydraulic Institute (2000), MIKE11 Computational Modules for Total Dissolved Gas and Water Temperature, DHI Presentation, Portland, OR.

Deas, M.L., Lowney, C.L. (2000*), Water Temperature Modeling Review Central Valley, Final Draft*, Prepared for the Bay Delta Modeling Forum.

Jones & Stokes Associates (1998), Potential Solutions for Achieving the San Joaquin River Dissolved Oxygen Objectives, Prepared for De Cuir & Somach, Sacramento, CA and the Department of Municipal Utilities, City of Stockton, California.

Jung, Marvin (2001), *Plots of Seasonal Dissolved Oxygen Trends of SMARTS Experiment #2*, Memo dated October 4, 2001.

Marv Jung and Associates (2000), Final Report on Experiment #2: Seasonal Water Quality Changes in Flooded Peat Soil environments Due to Peat Soil, Water Depth, and Water Exchange Rate, Prepared for the Municipal Water Quality Investigations Program.

Municipal Water Quality Investigations Program (2001), Email messages regarding temperatures at Bacon Island.

Municipal Water Quality Investigations Program (1998), *Compendium of Water Quality Investigations in the Sacramento Watershed, Sacramento-San Joaquin Delta, and San Francisco Bay Area*, Sacramento, CA.

Research Management Associates (1998), *HEC-5 Users Manual, Simulation of Flood Control and Conservation Systems, Appendix on Water Quality Analysis*, Prepared for the US Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA.

US Army Corps of Engineers (1978), WQRRS Water Quality for River-Reservoir Systems, Hydrologic Engineering Center, Davis, CA.

US Department of Energy (1998), *Energy Smart Pools Software*, US Department of Energy website.

US Department of the Interior (1999), *The Algal-Bacterial Selenium Removal System for Treatment of Irrigation Drainage Water: Demonstration Facility Interim Studies*, Bureau of Reclamation, Technical Service Center, Water Treatment and Engineering Research Group.

Welch,E.B. (1996), *Ecological Effects of Wastewater Applied limnology and pollutant effects*, Cambridge University Press.

Appendix 5A

Figure 5-1 Delta Meteorological and Flow Stations

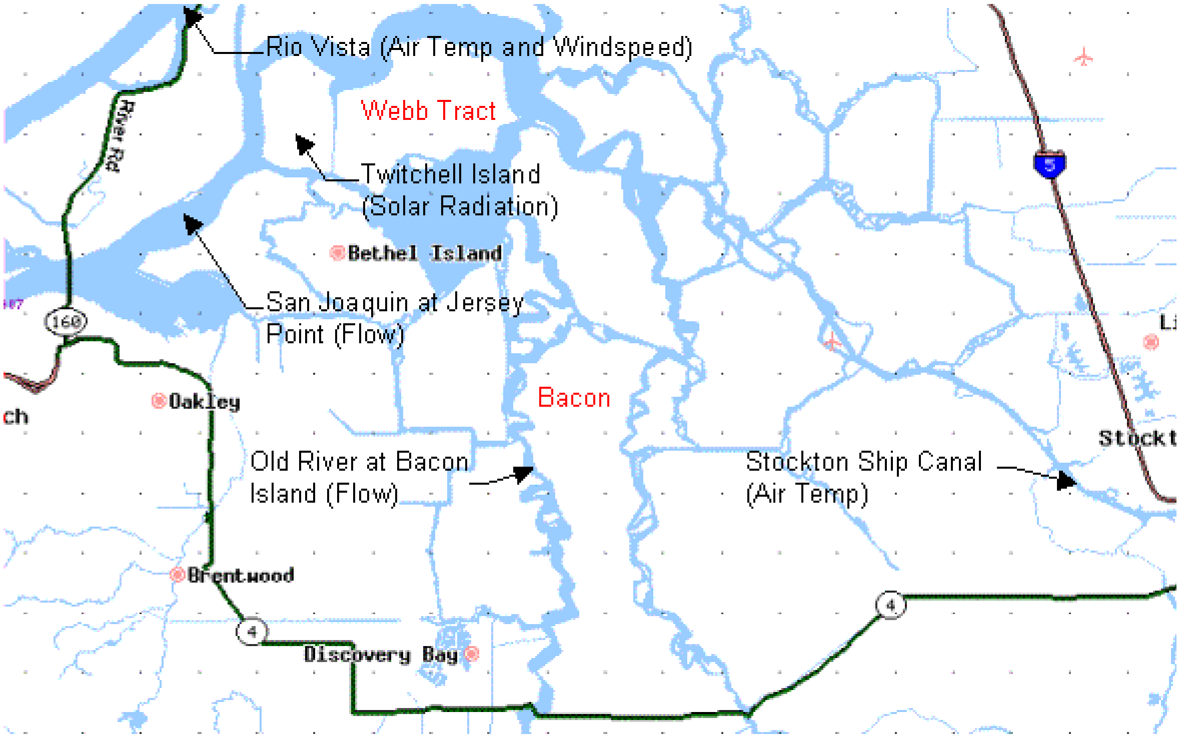


Figure 5-2 Stockton Air Temperatures

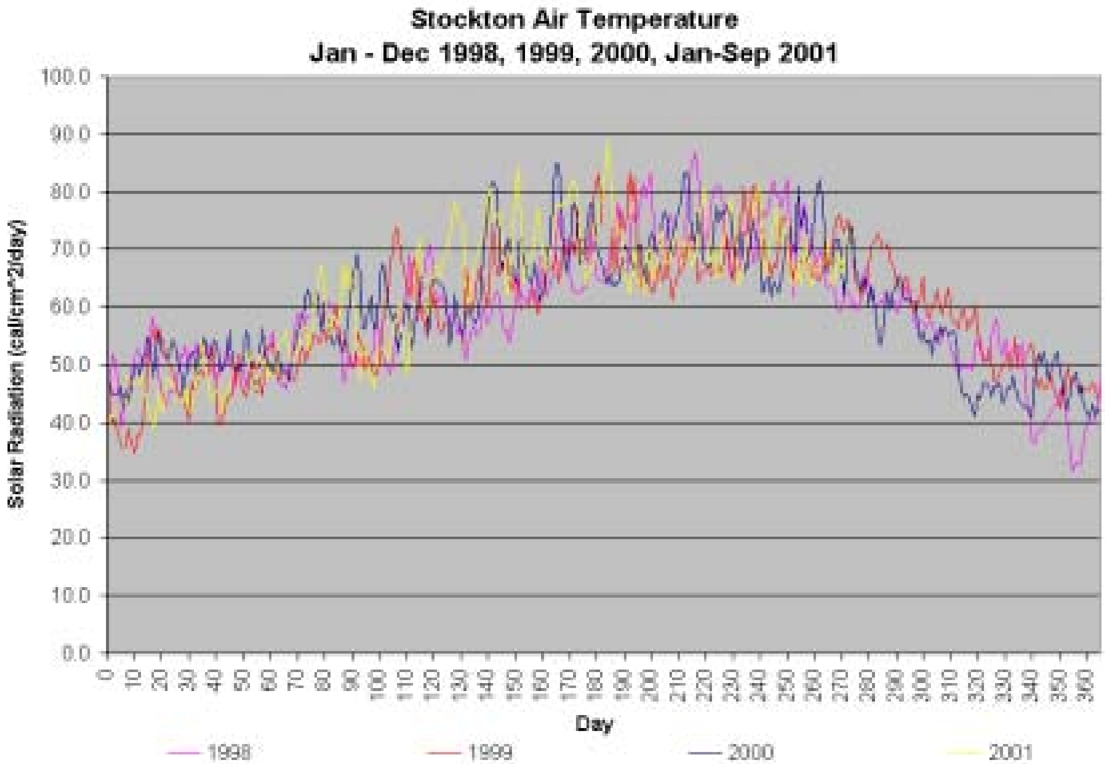



Figure 5-3 Rio Vista Air Temperatures

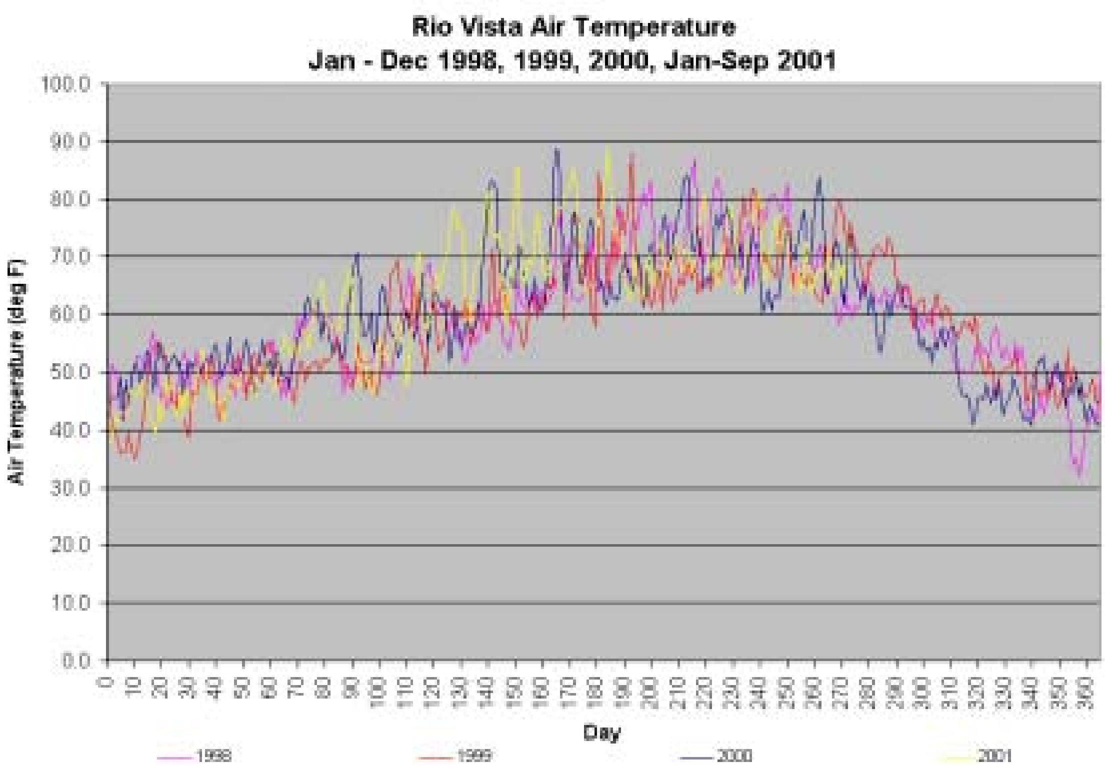


Figure 5-4  San Joaquin at Jersey Point Flows

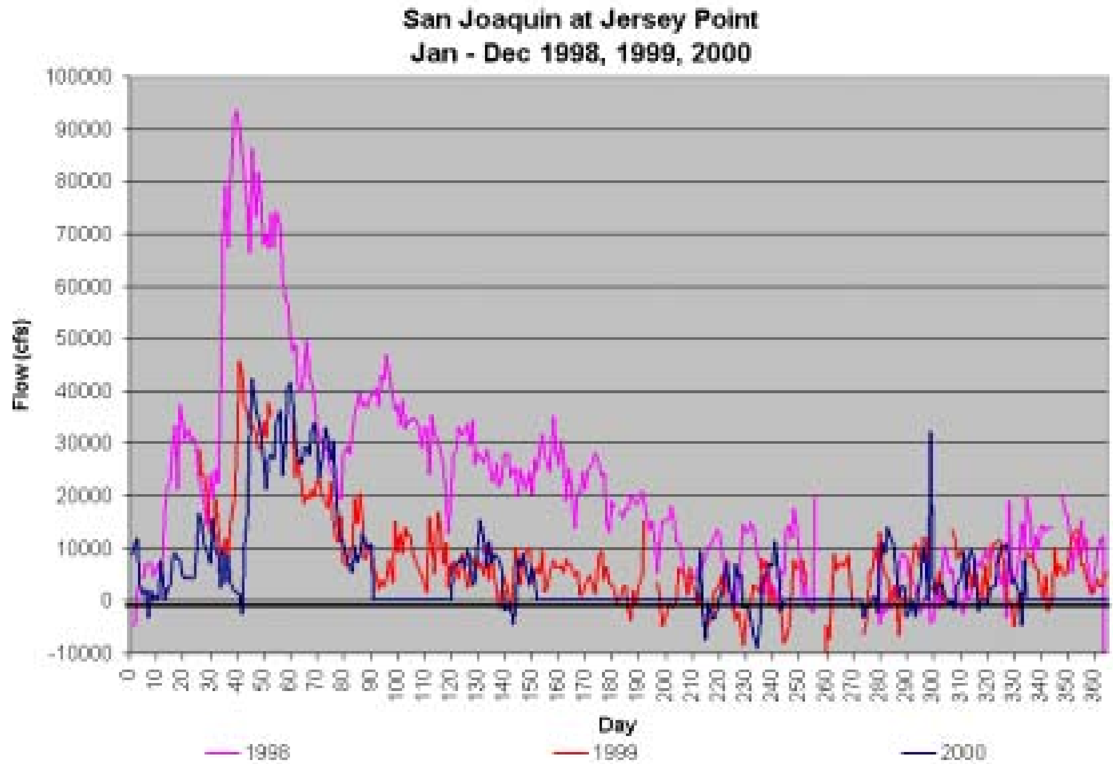



Figure 5-5  Old River at Bacon Island Flows

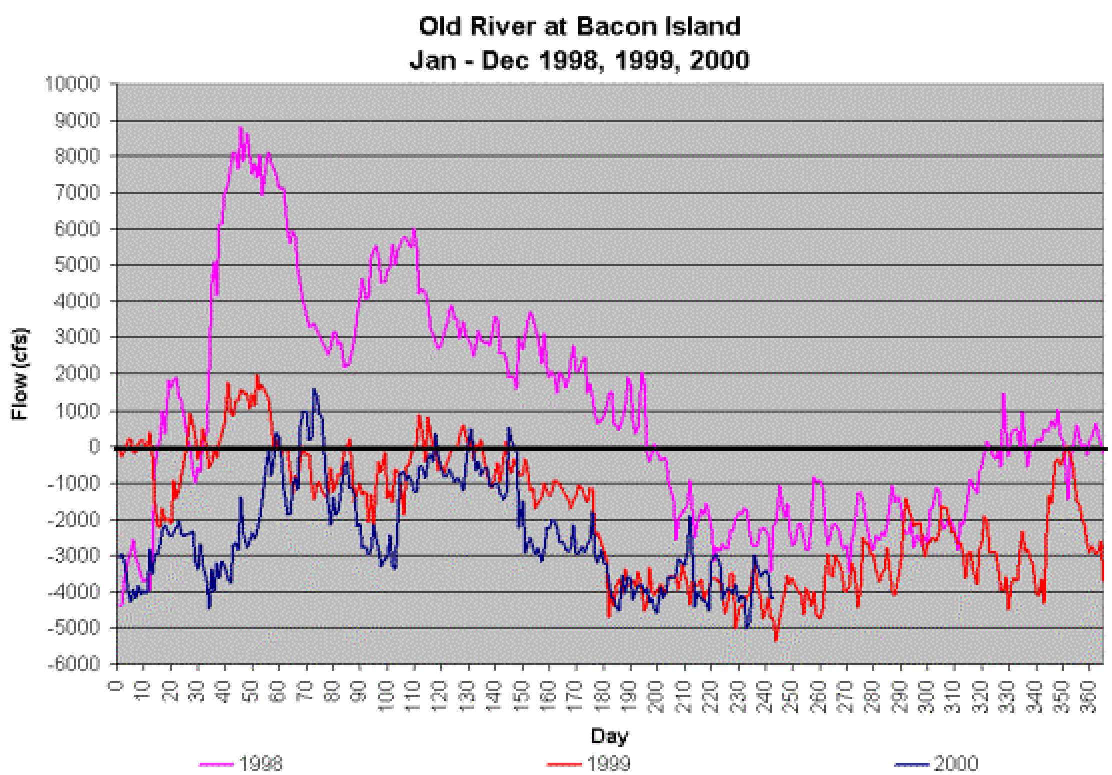


Figure 5-6  Delta Water Temperature Stations

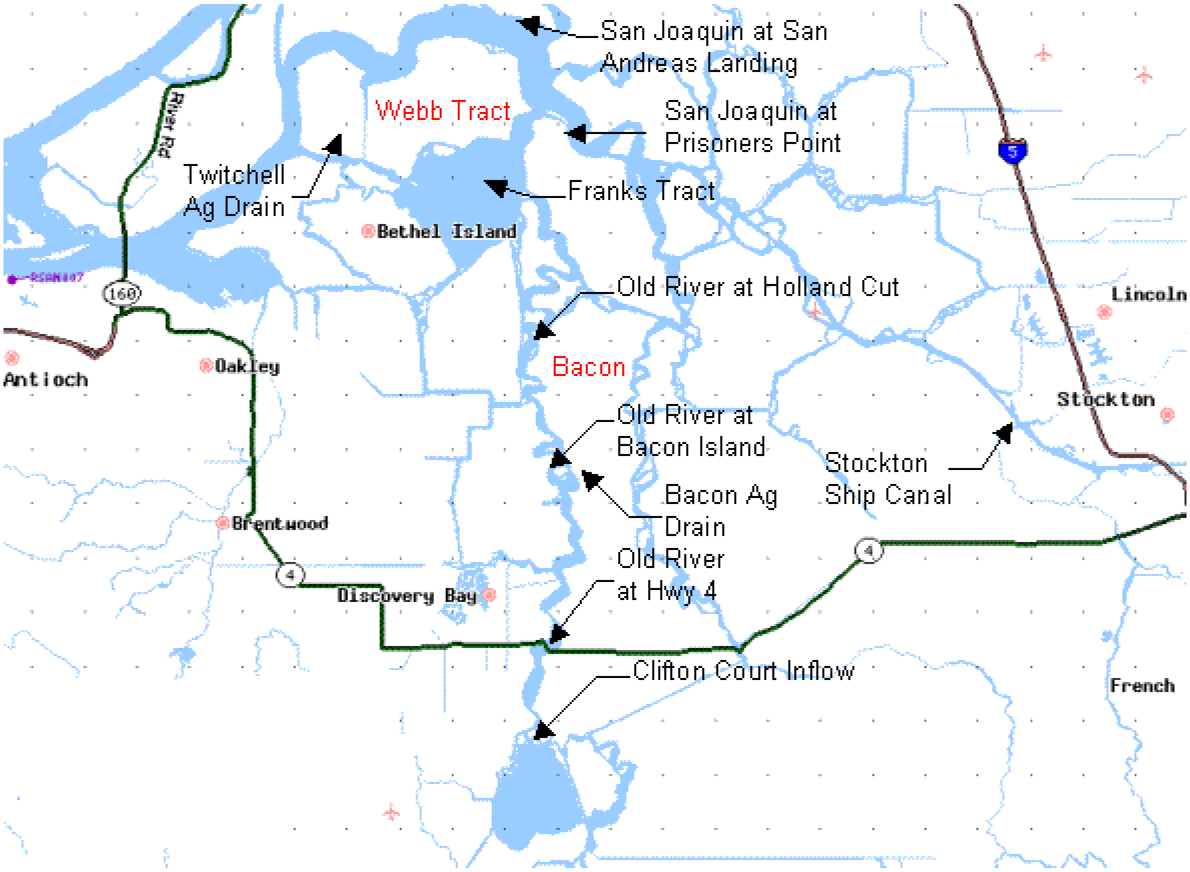


Figure 5-7  2000 Delta Water Temperatures

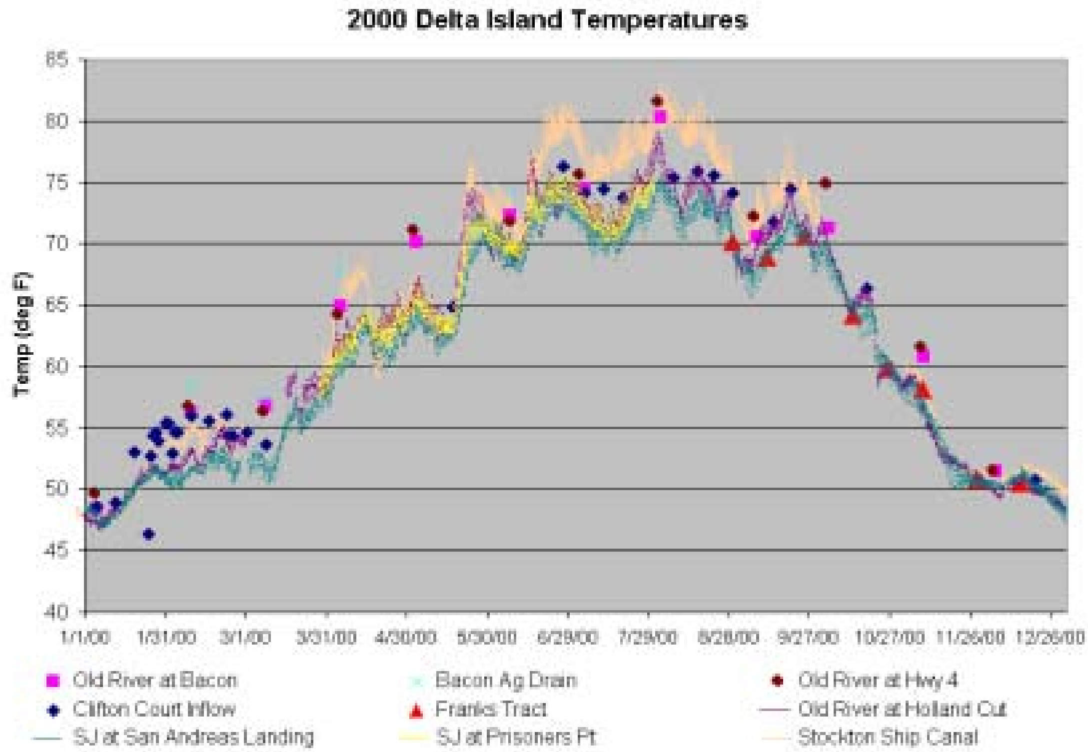



Figure 5-8  2001 Delta Water Temperatures

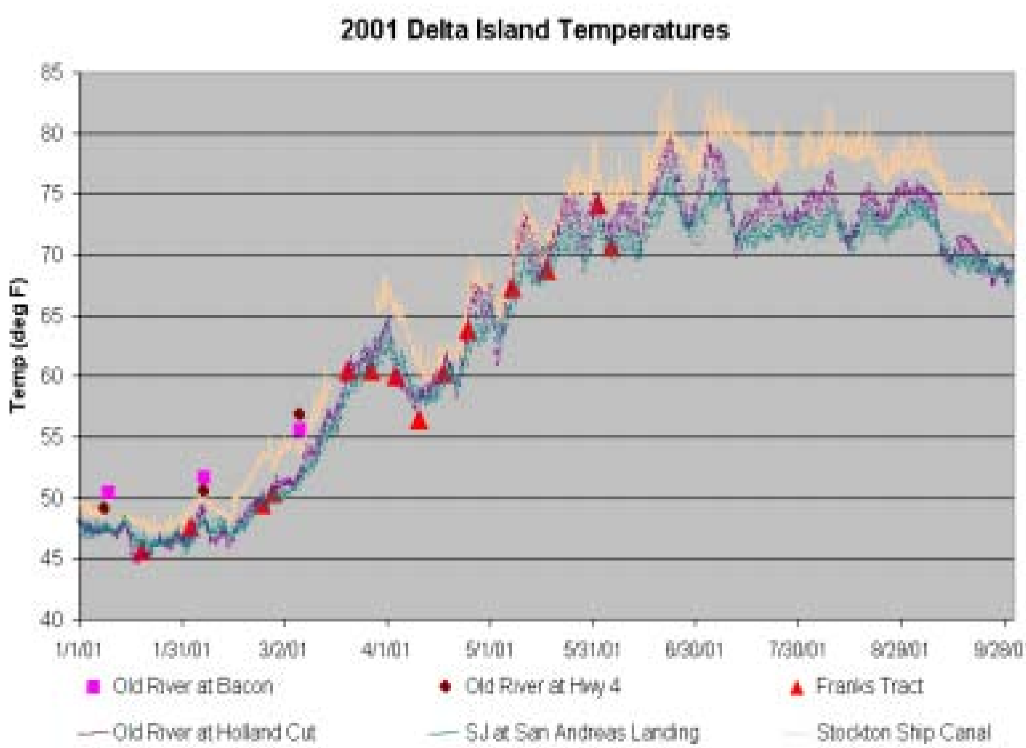


Figure 5-9 1999 Delta Water Temperatures

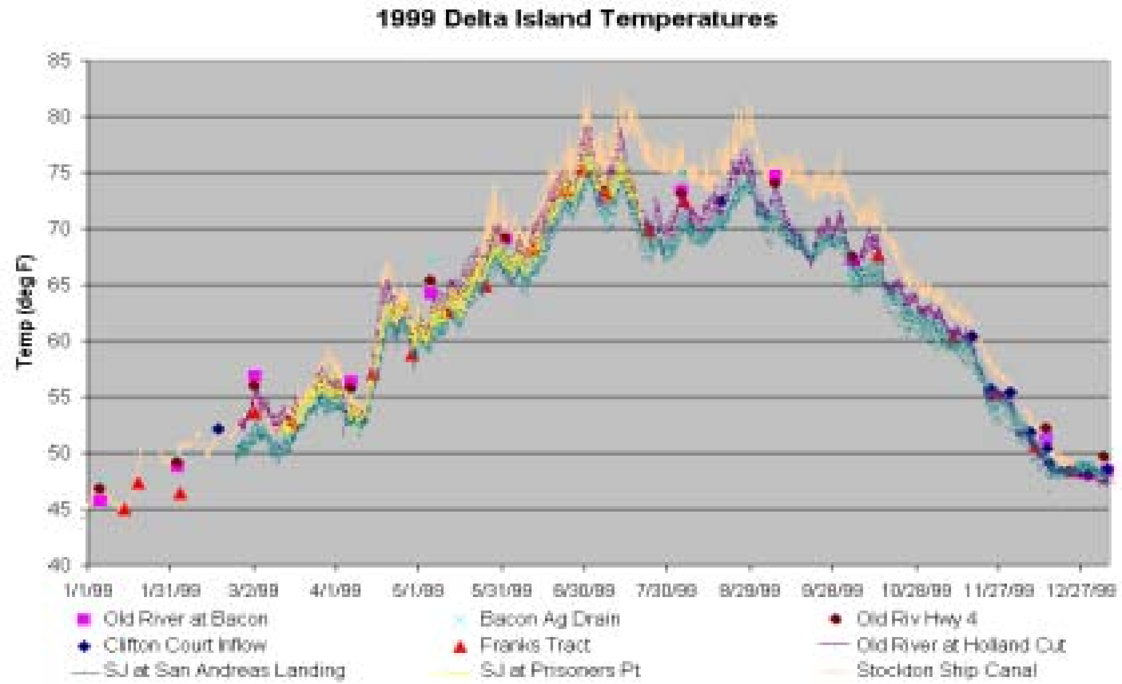



Figure 5-10 1998 Delta Water Temperatures

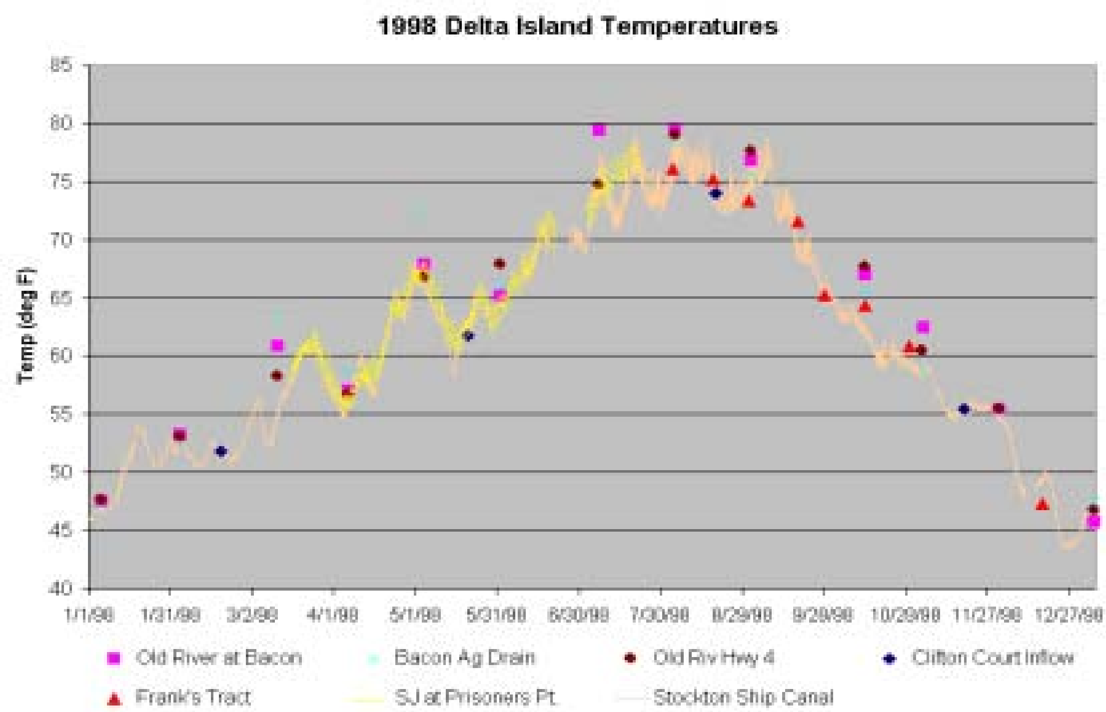


Figure 5-11 Heat Budget Schematic

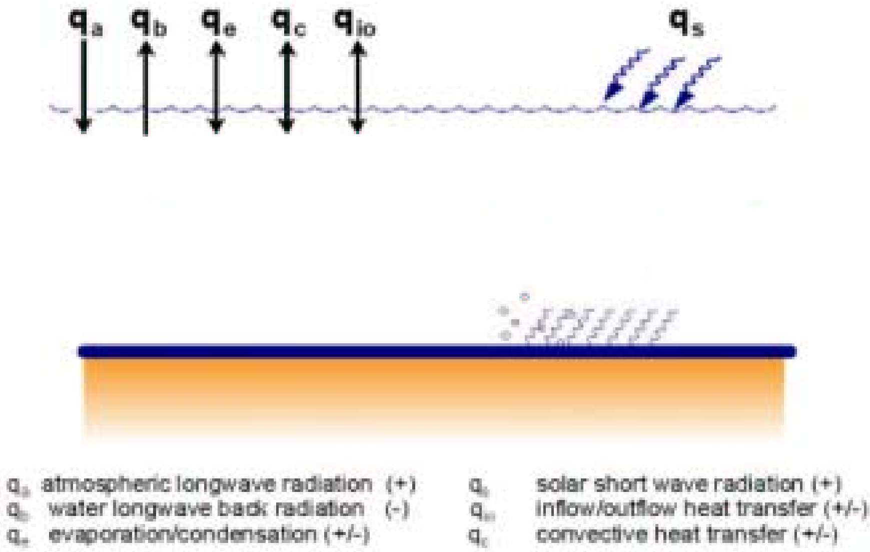



Figure 5-12 Webb Tract and Bacon Island Fill Operations

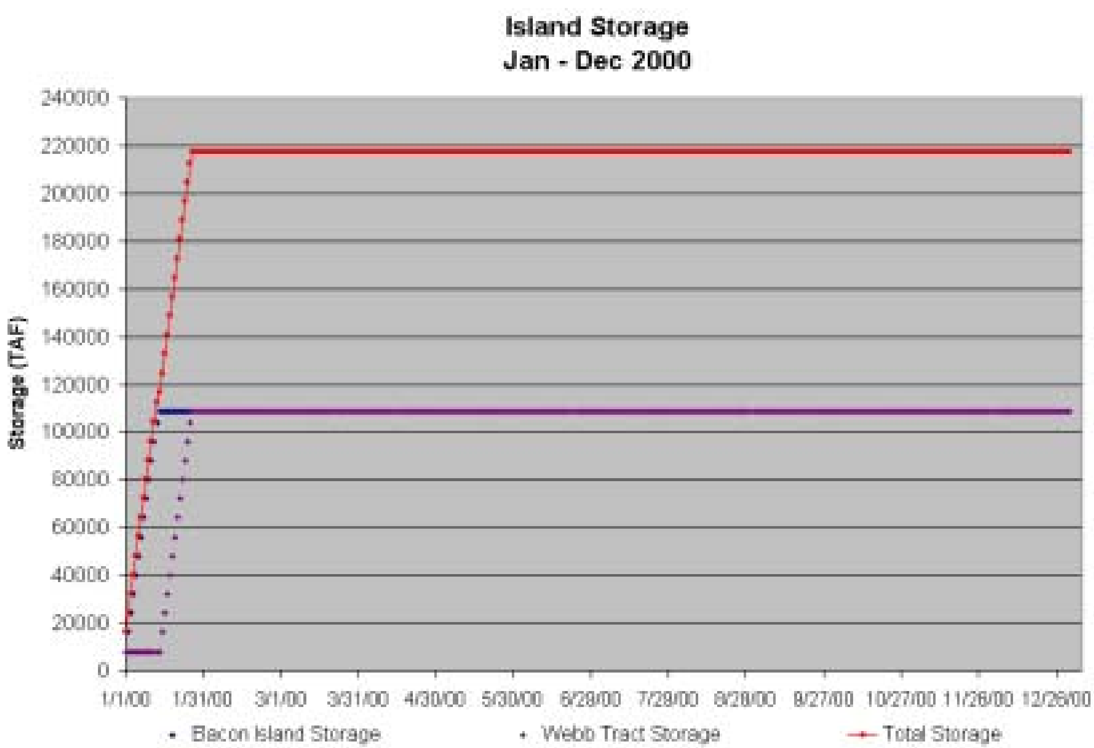


Figure 5-13 Webb Tract Water Temperature Model Verification

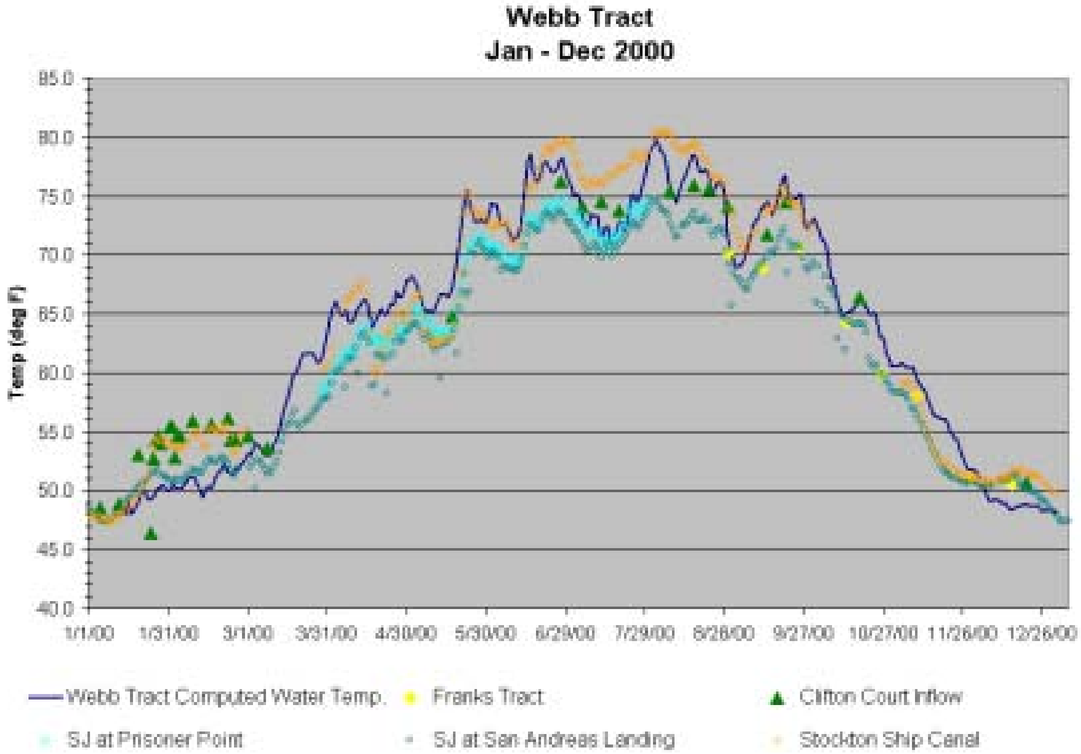



Figure 5-14 Bacon Island Water Temperature Model Verification

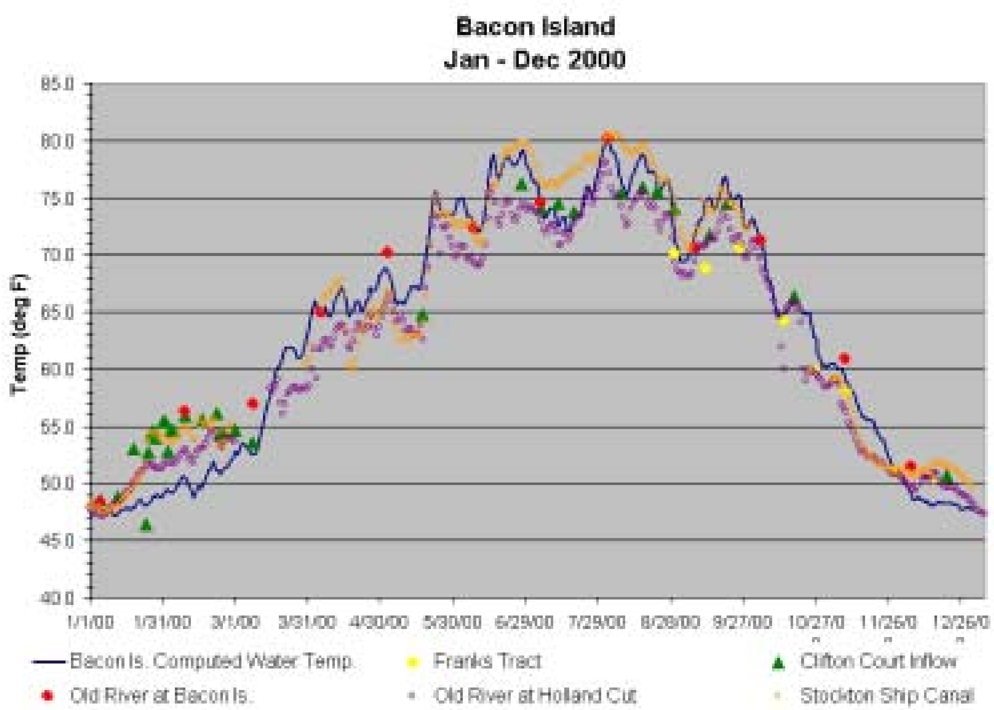


Figure 5-15 Webb Tract Temperature Differences for 2000

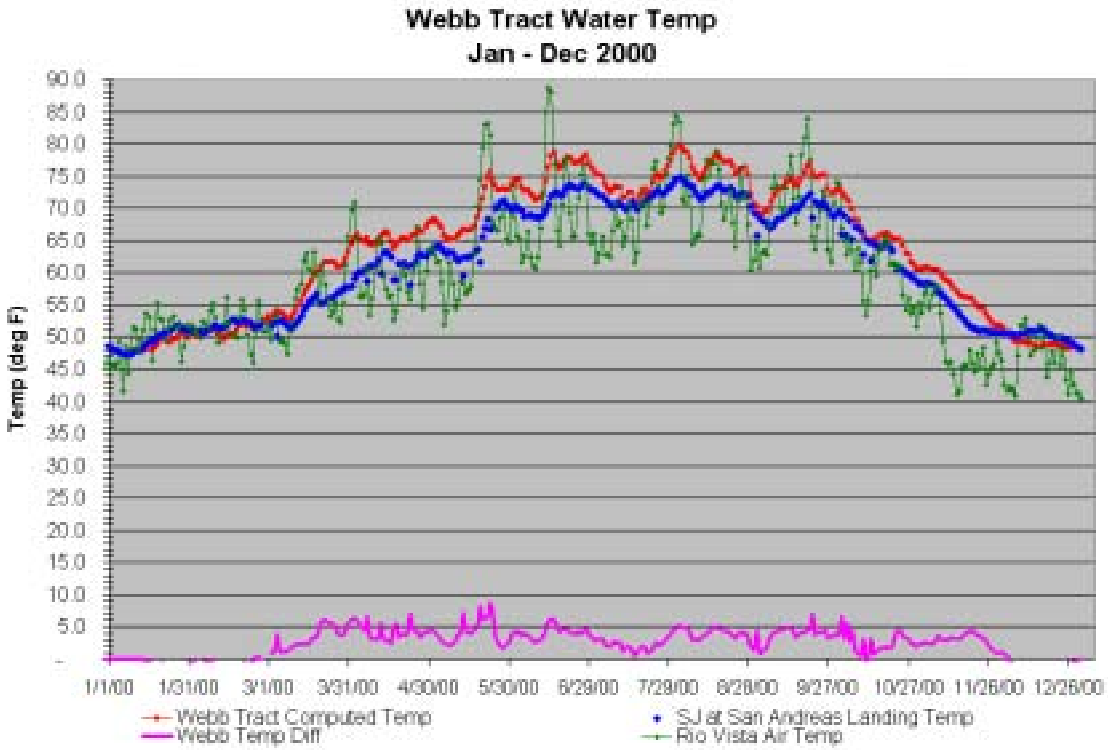



Figure 5-16 Bacon Island Temperature Differences for 2000

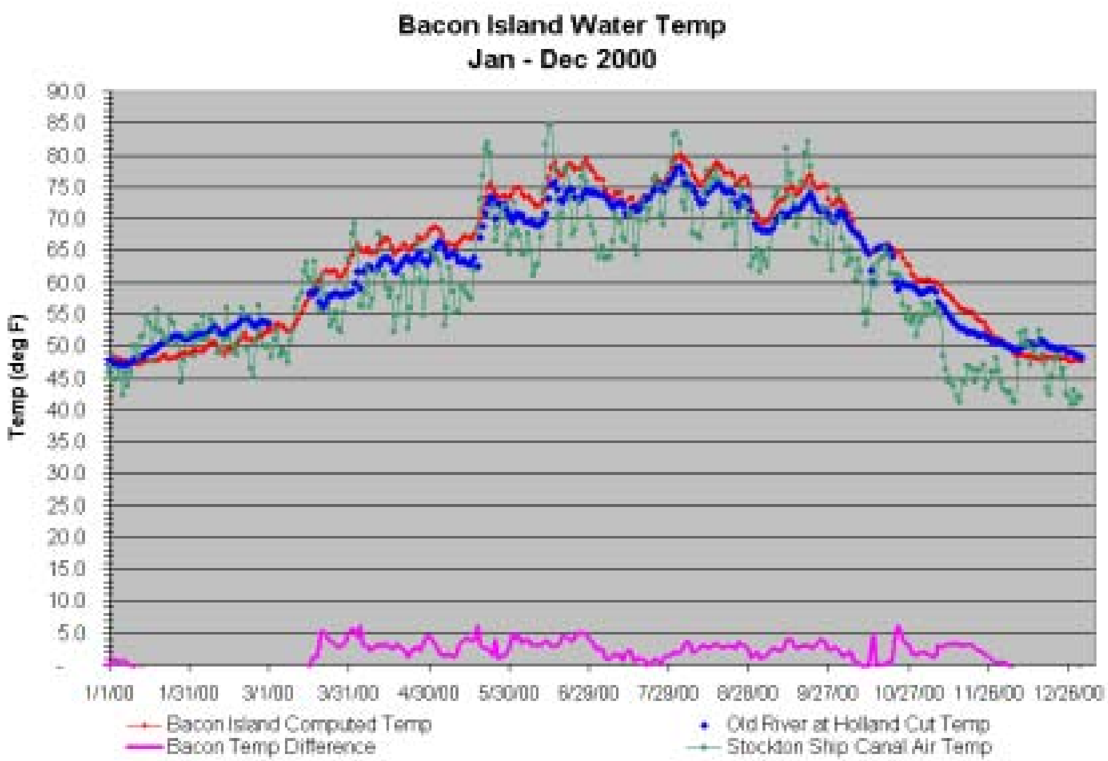


Figure 5-17 Webb Tract Temperature Differences for 2001

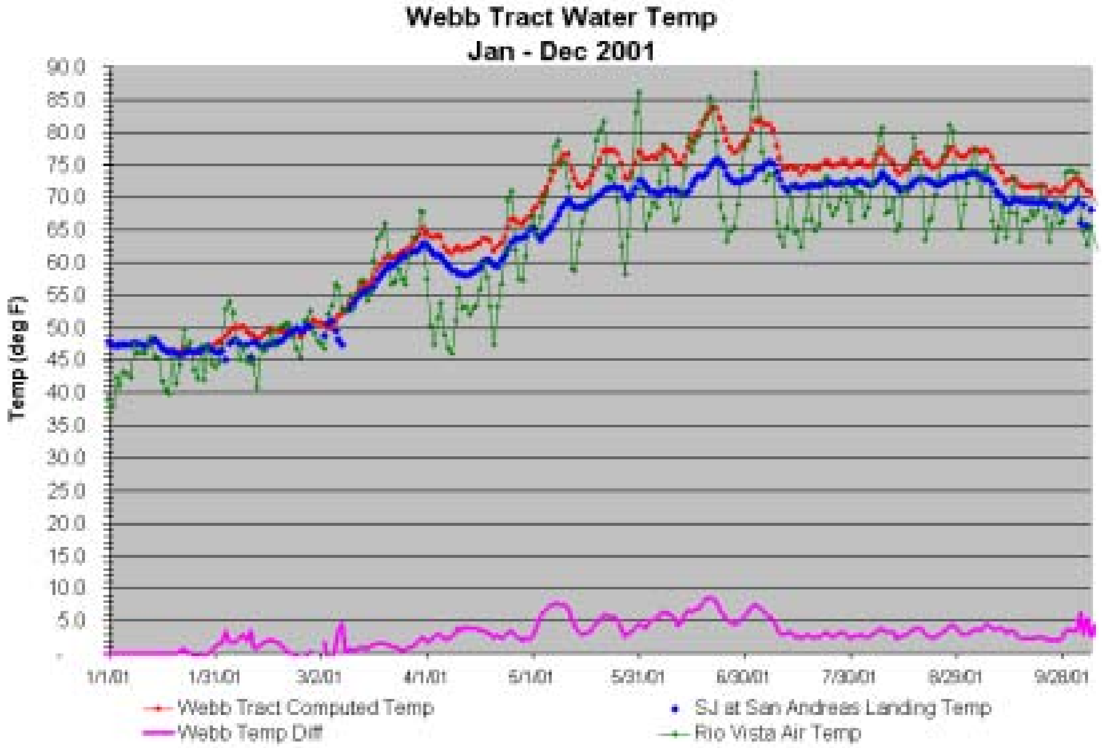



Figure 5-18 Bacon Island Temperature Differences for 2001

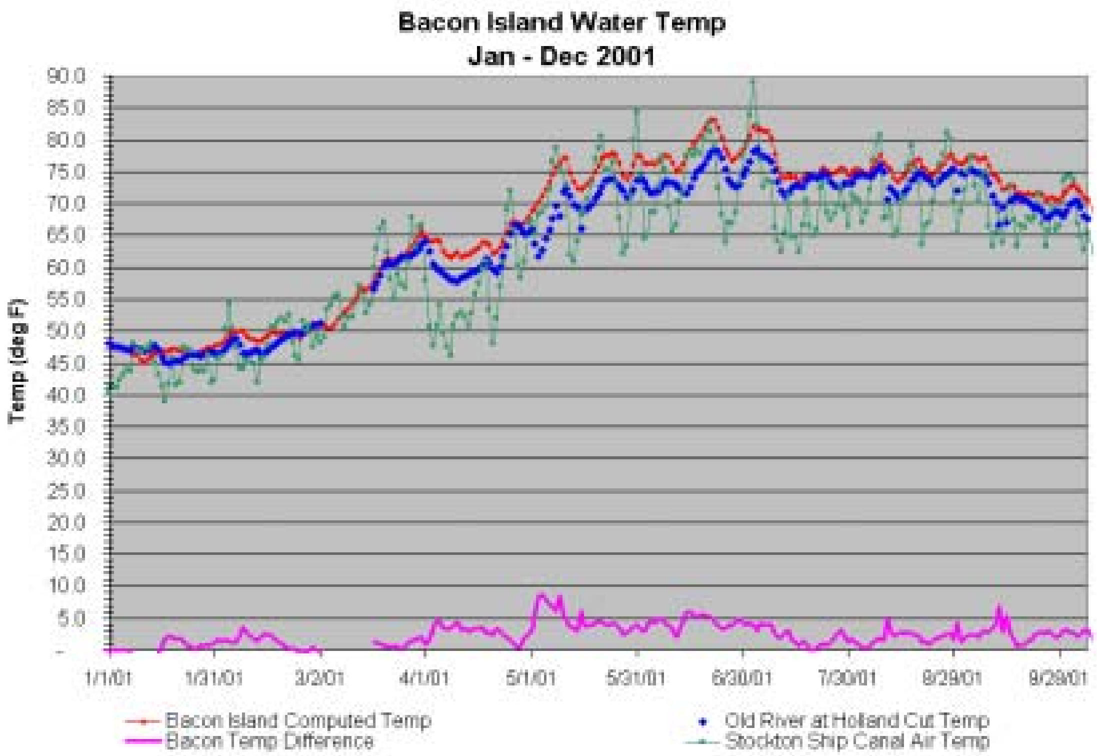


Figure 5-19 Webb Tract Temperature Differences for 1999

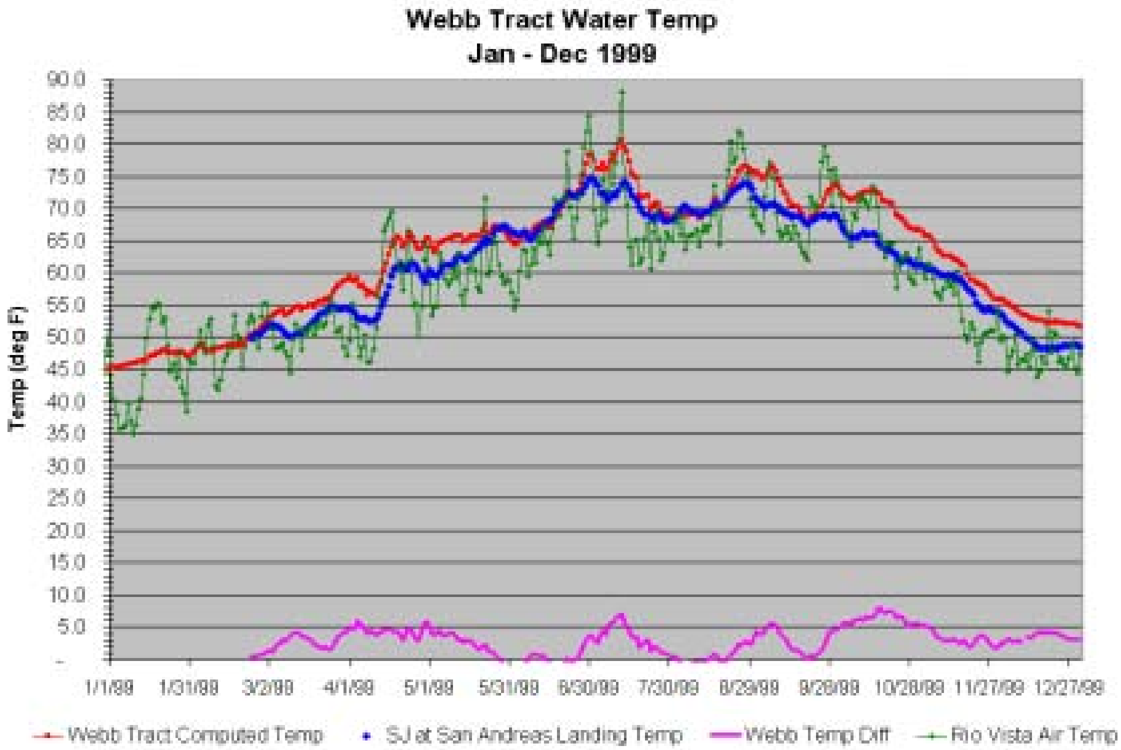



Figure 5-20 Bacon Island Temperature Differences for 1999

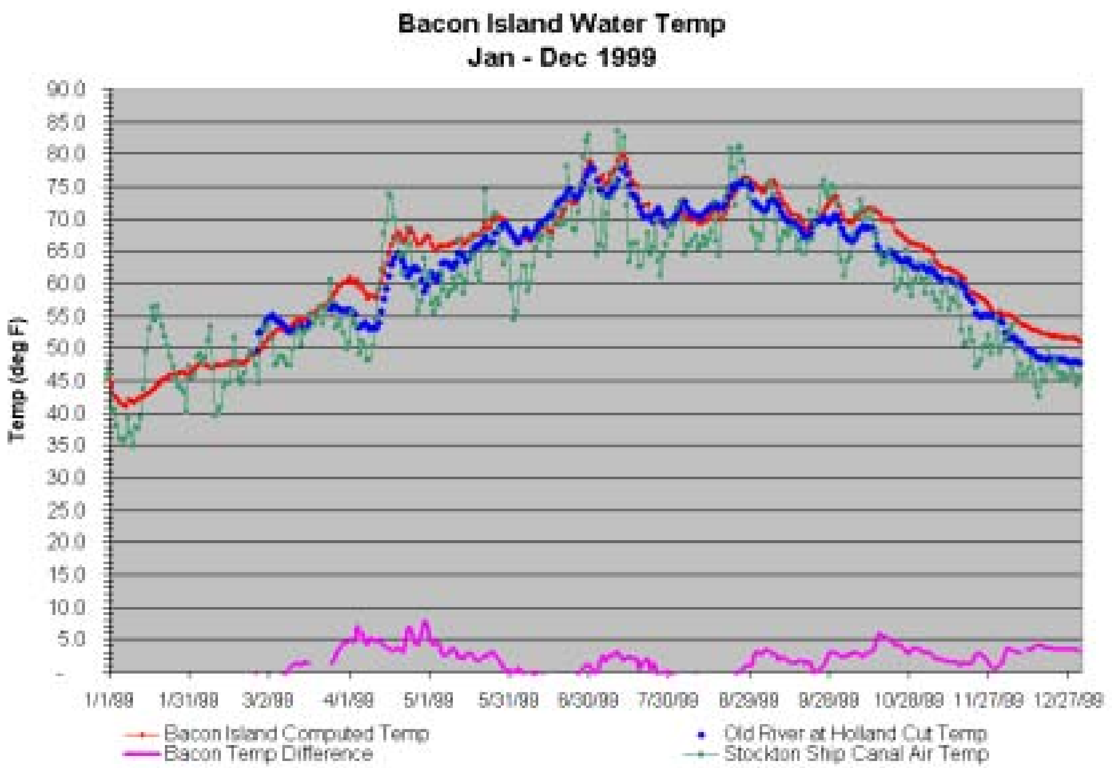


Figure 5-21 Webb Tract Temperature Differences for 1998

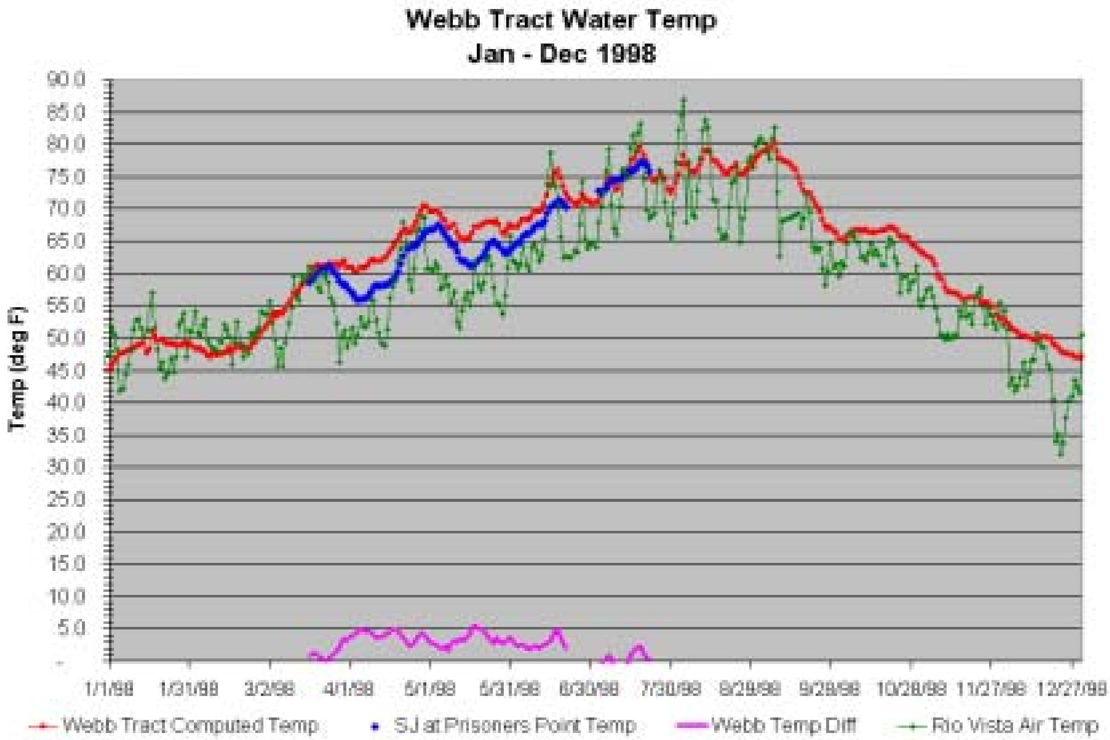



Figure 5-22 Webb Tract Temperature Mass Balance for 2000

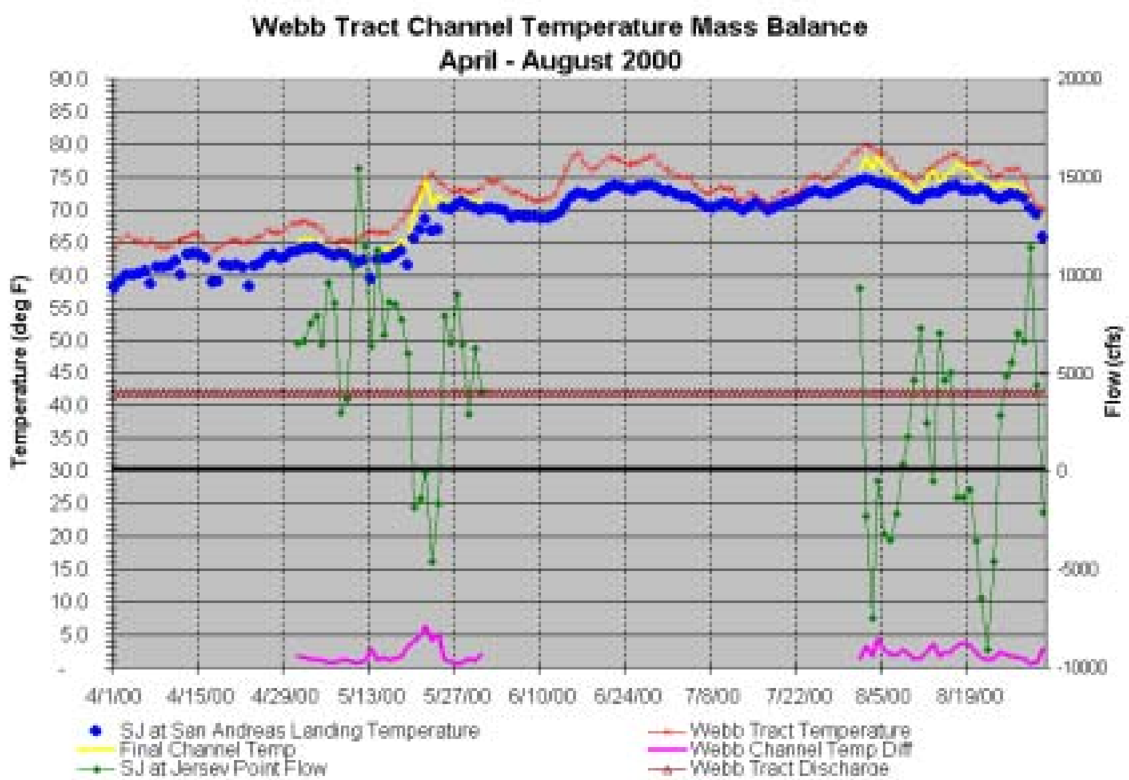


Figure 5-23 Bacon Island Temperature Mass Balance for 2000

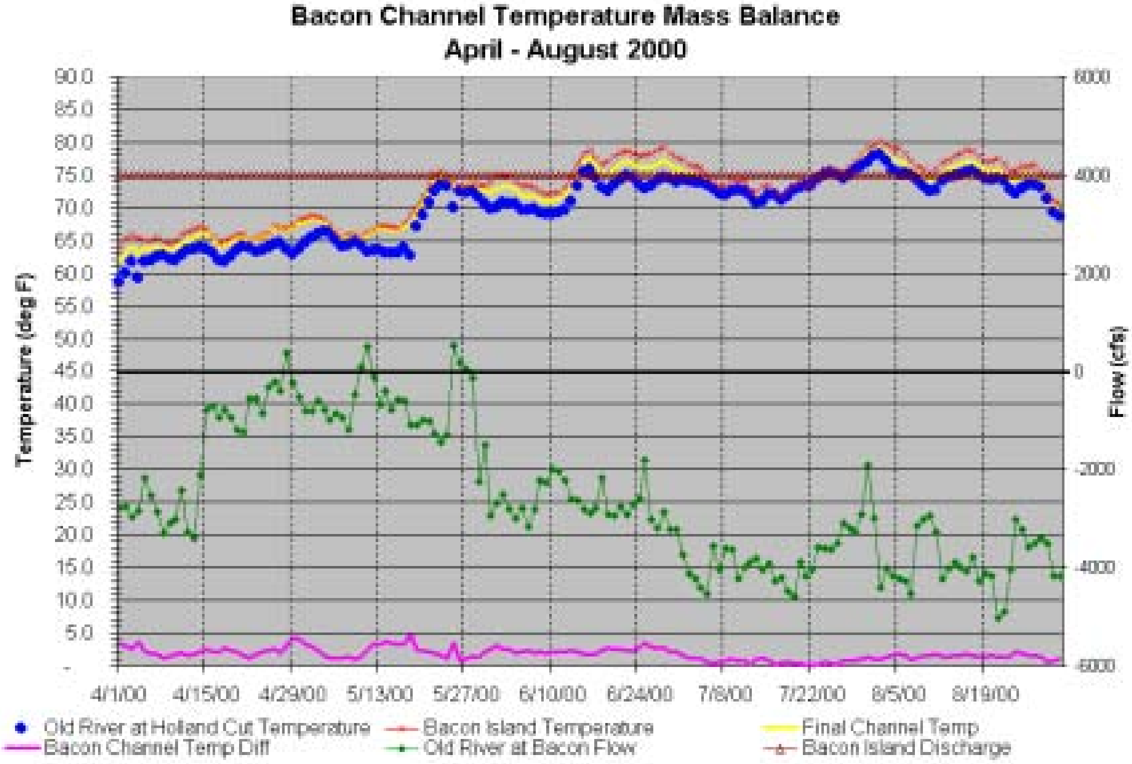



Figure 5-24 Webb Tract Temperature Mass Balance for 1999

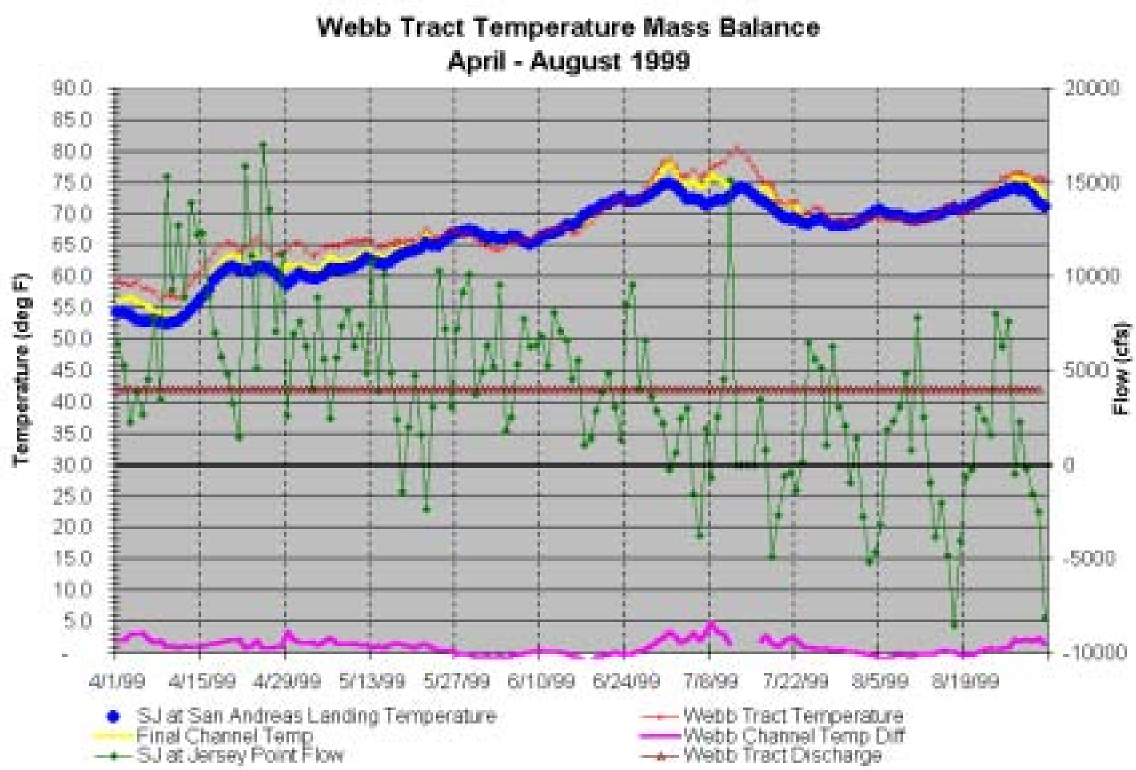


Figure 5-25 Bacon Island Temperature Mass Balance for 1999

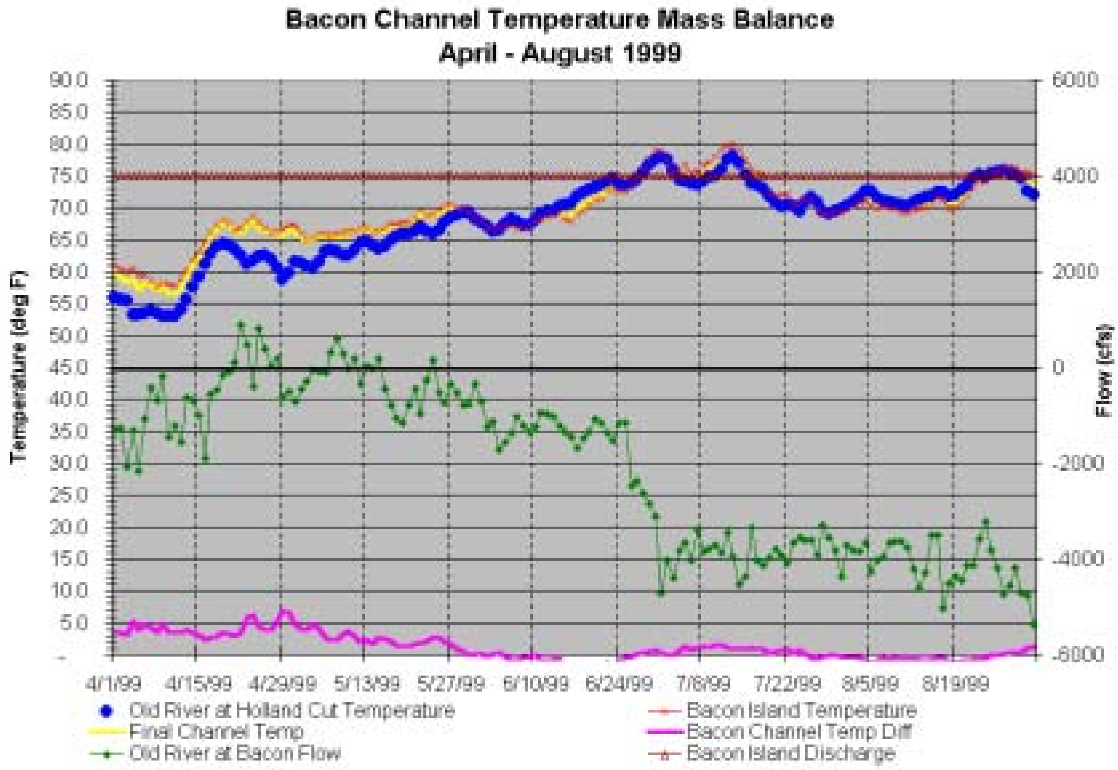



Figure 5-26 Webb Tract Temperature Mass Balance for 1998

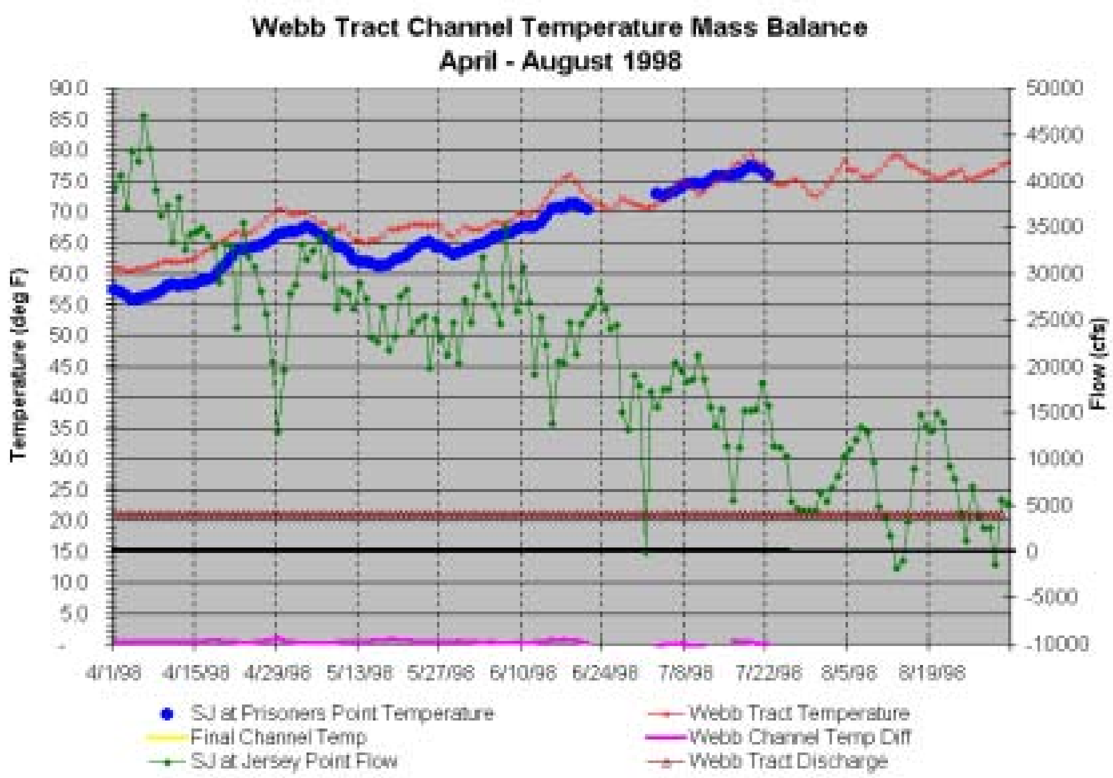


Figure 5-27  Delta Dissolved Oxygen Stations

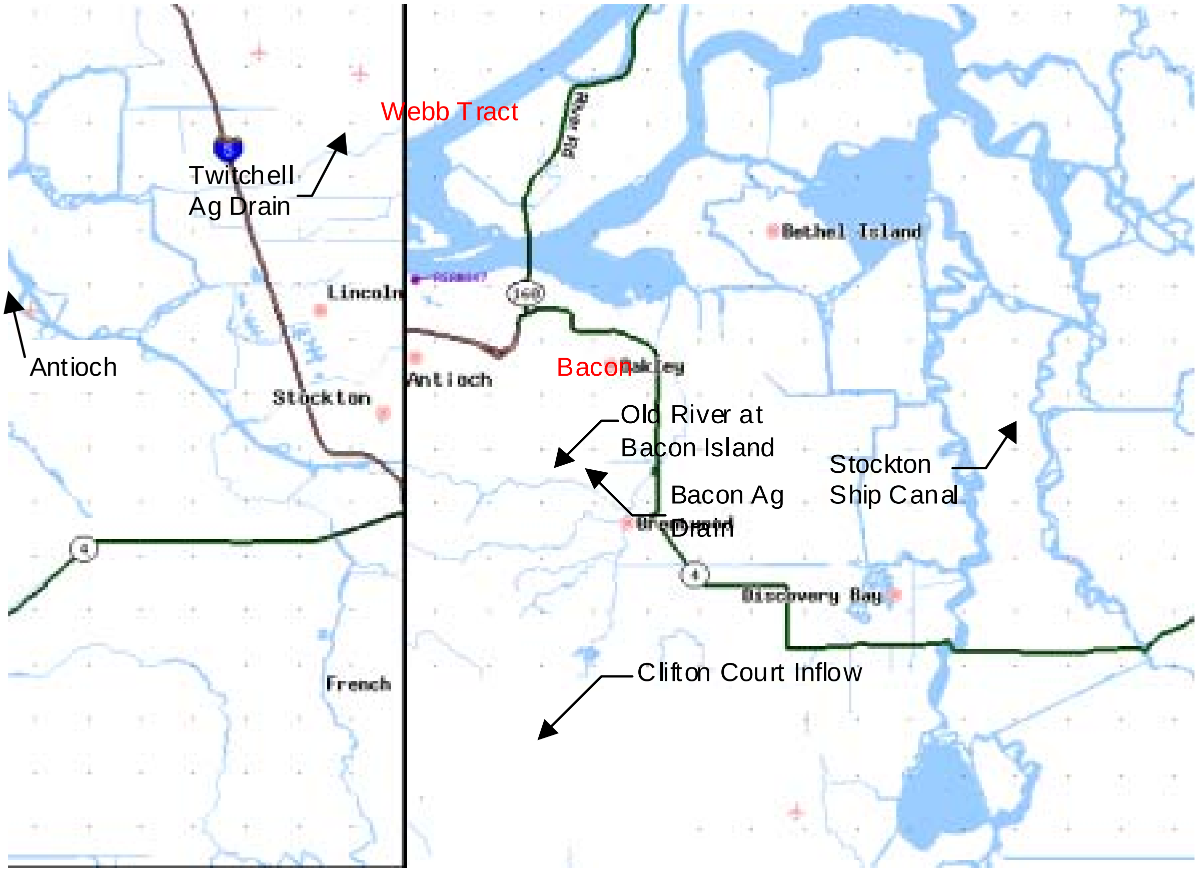


Figure 5-28  2000 Delta Dissolved Oxygen Concentrations

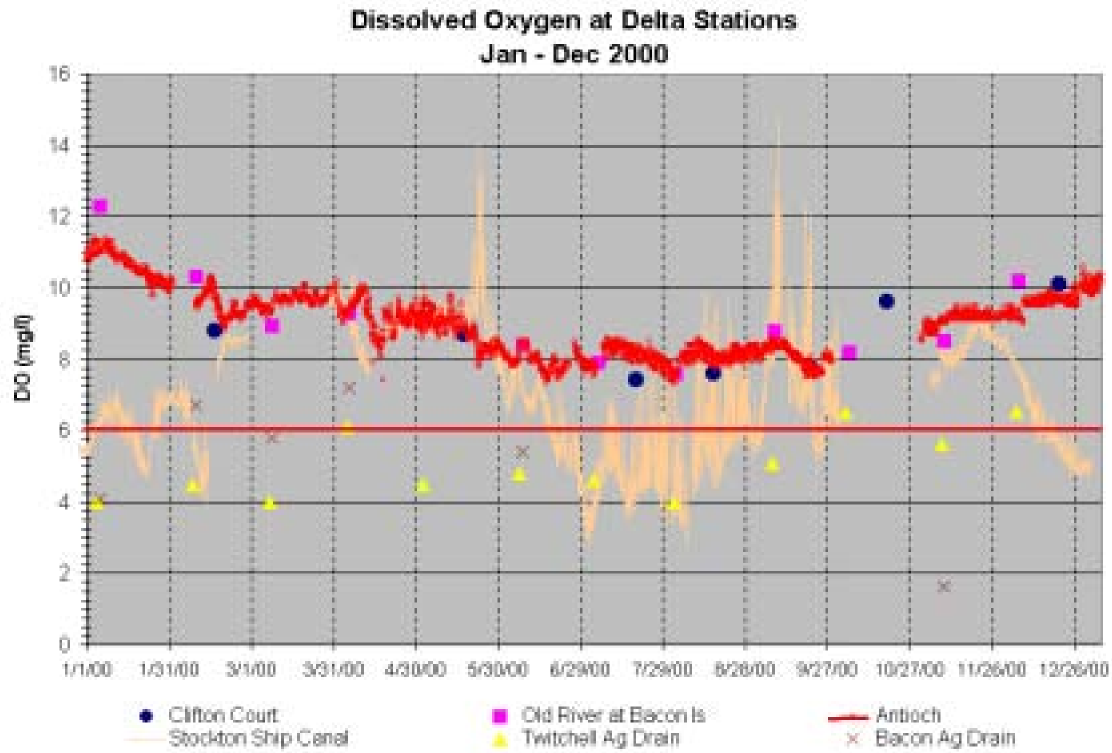



Figure 5-29  1999 Delta Dissolved Oxygen Concentrations

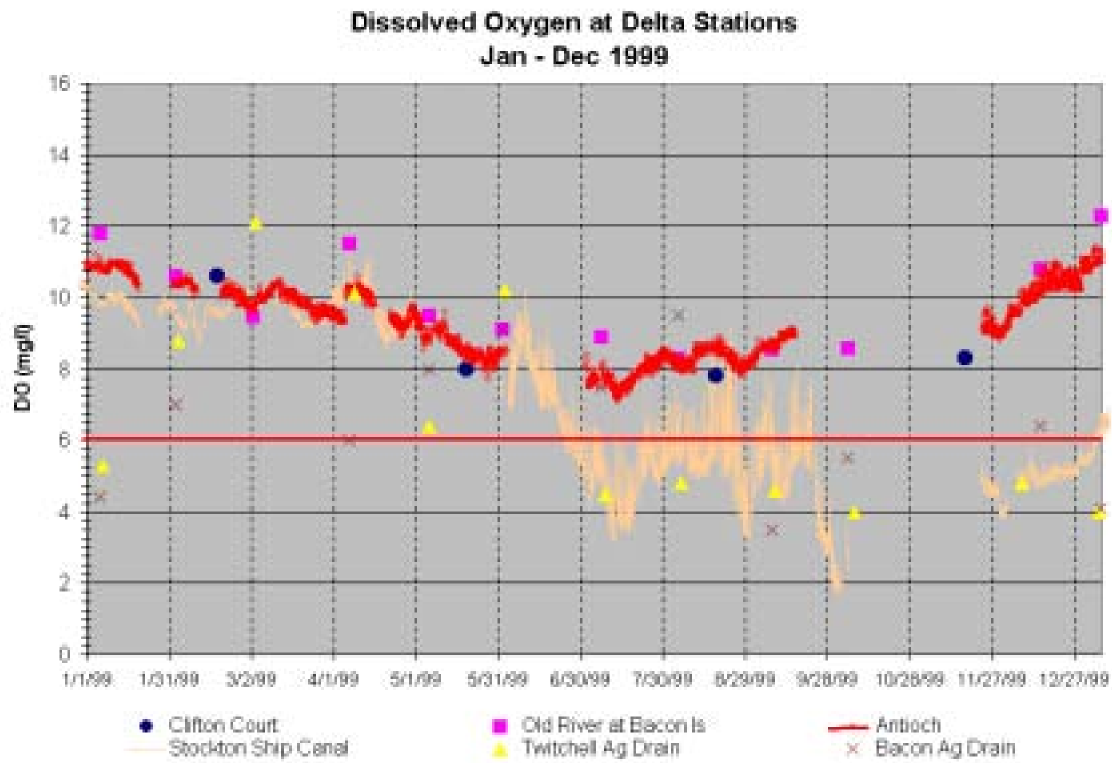


Figure 5-30  1998 Delta Dissolved Oxygen Concentrations

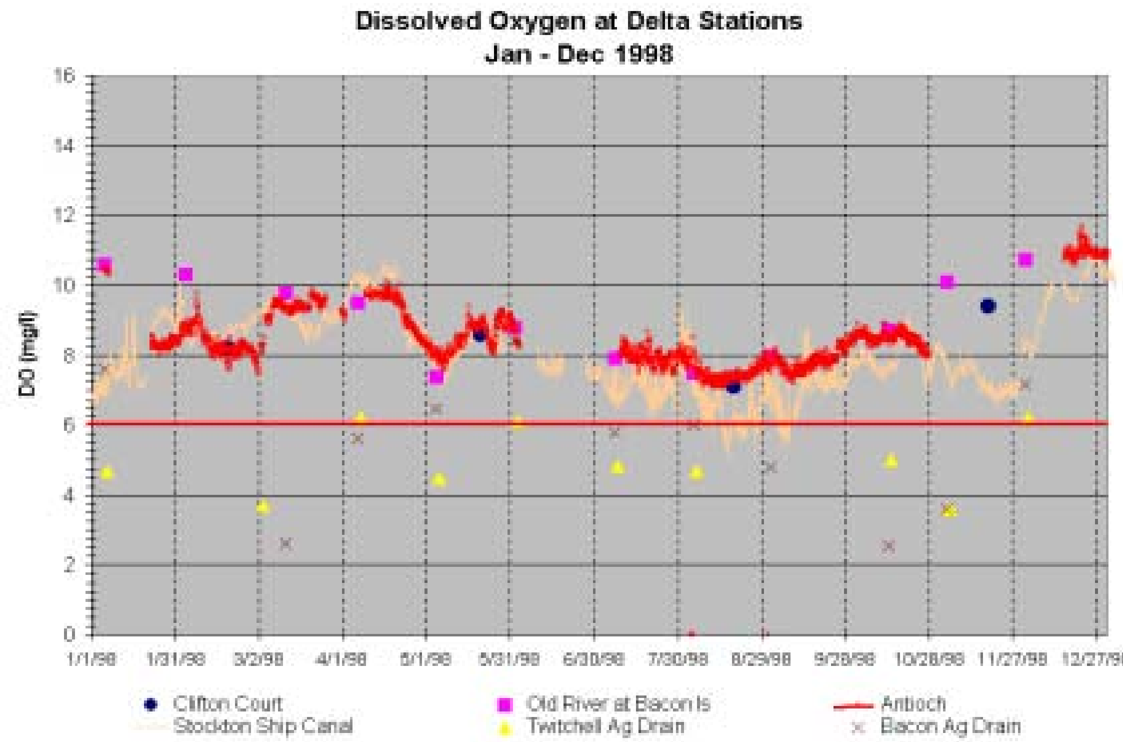


Figure 5-31  Dissolved Oxygen Schematic

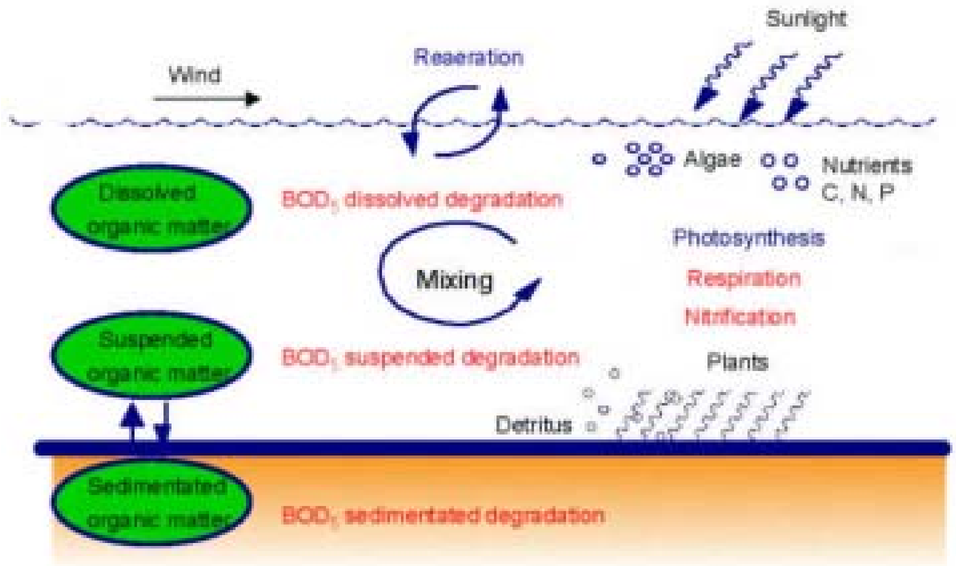



Figure 5-32  SMARTS Tank Experiment

Figure 5-33 Tank 5 Dissolved Oxygen Concentrations

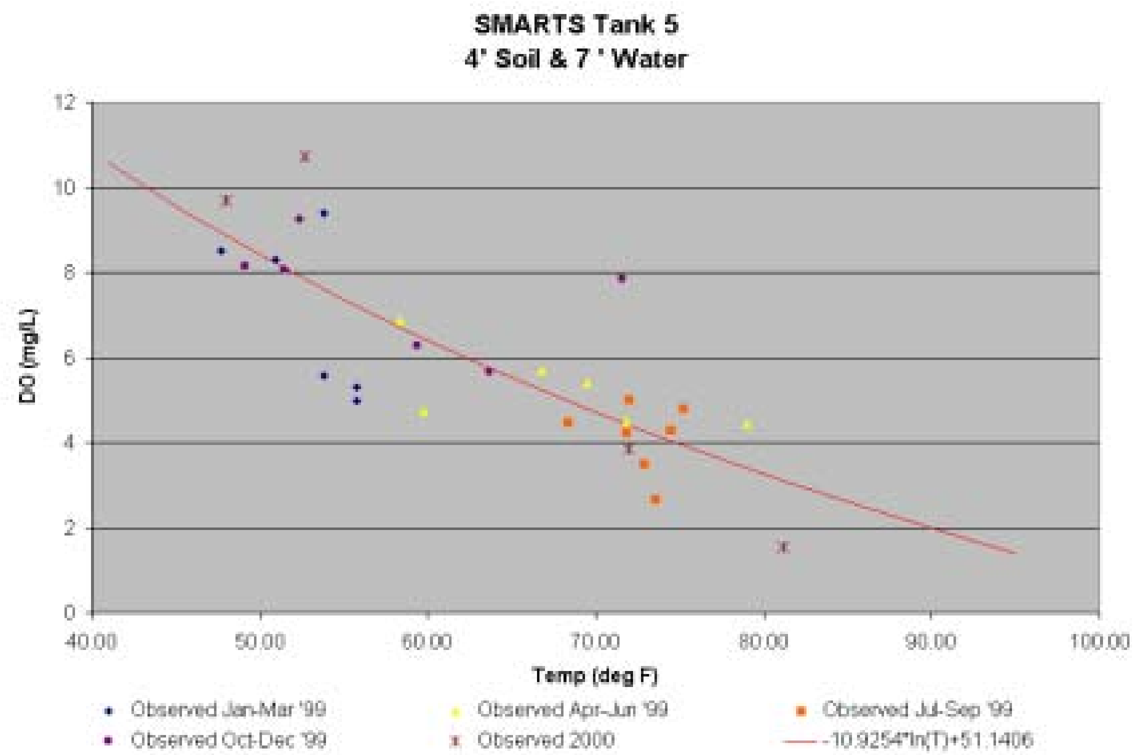



Figure 5-34 Tank 7 Dissolved Oxygen Concentrations

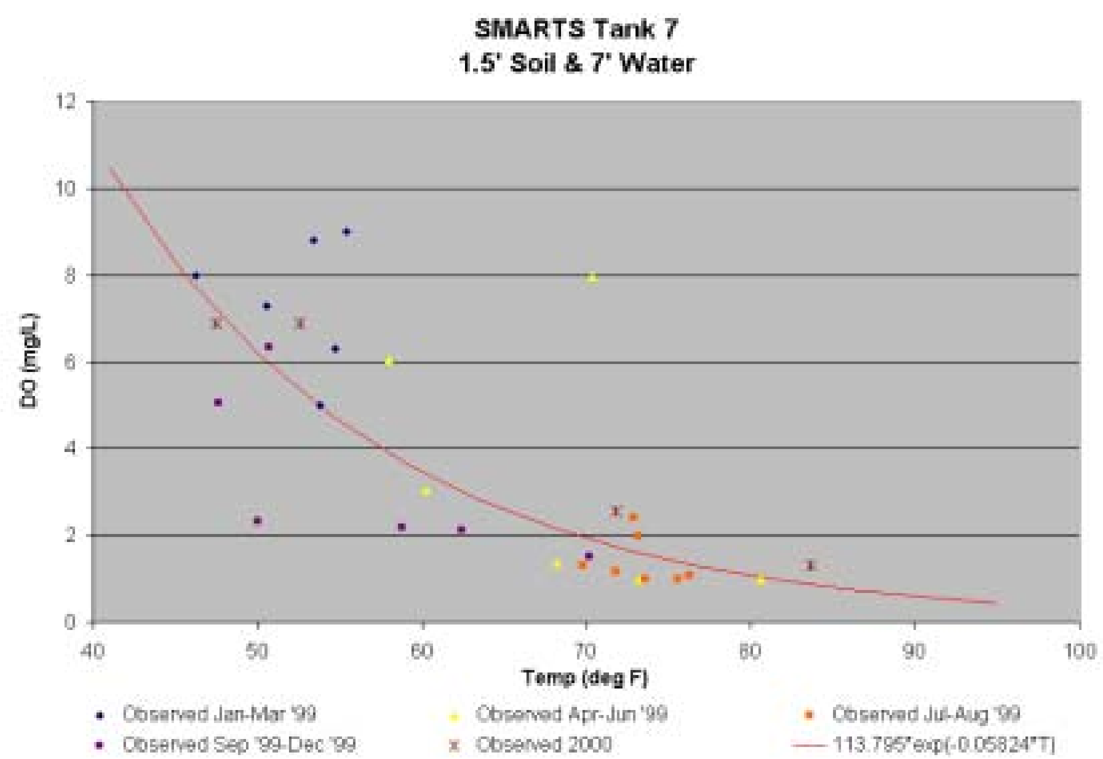


Figure 5-35 Phytoplankton Curves

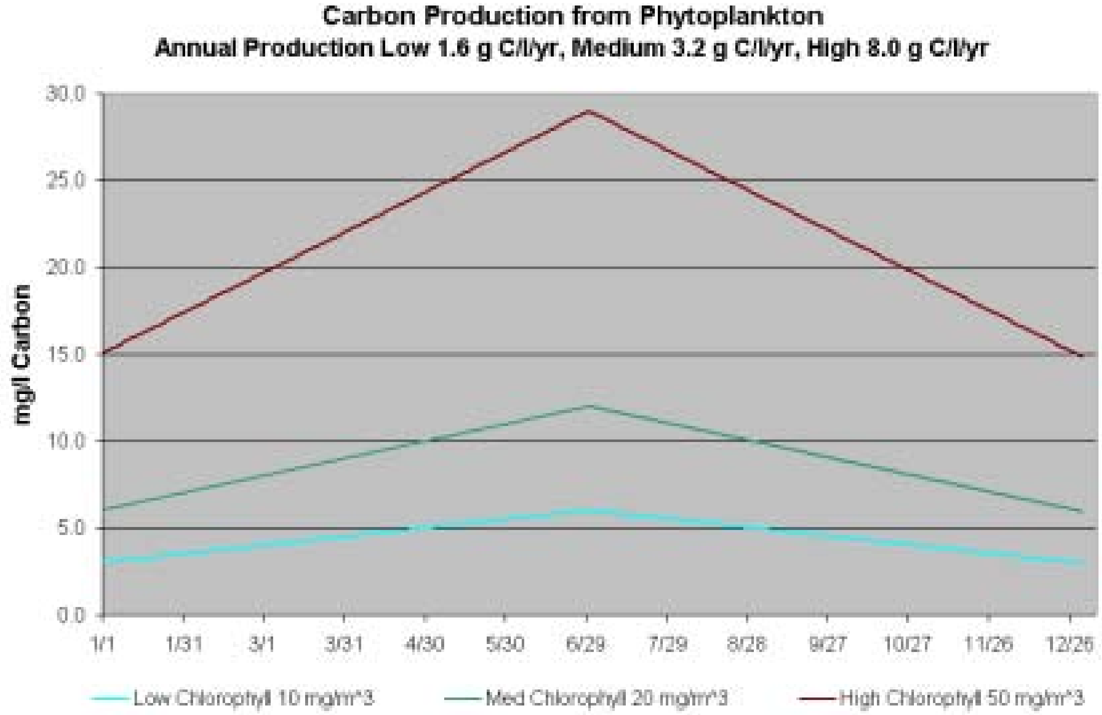



Figure 5-36 DO for Different Phytoplankton Concentrations

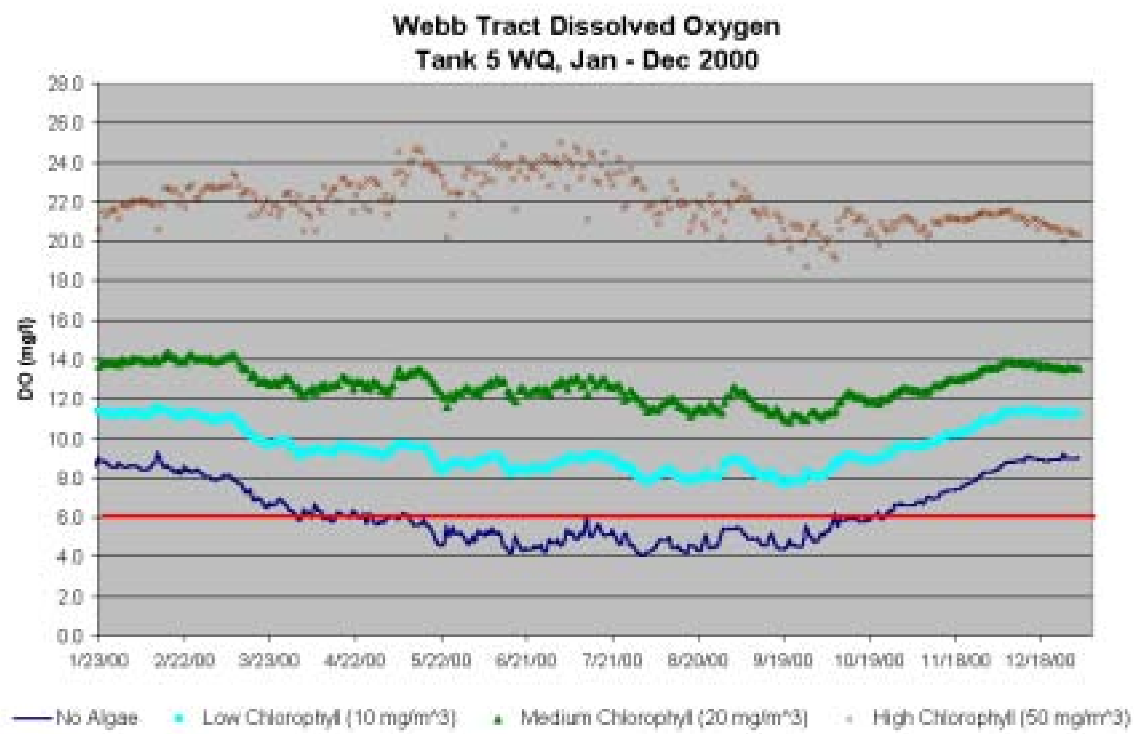


Figure 5-37 Webb Tract DO Plot, Tank 5 Water Quality for 2000

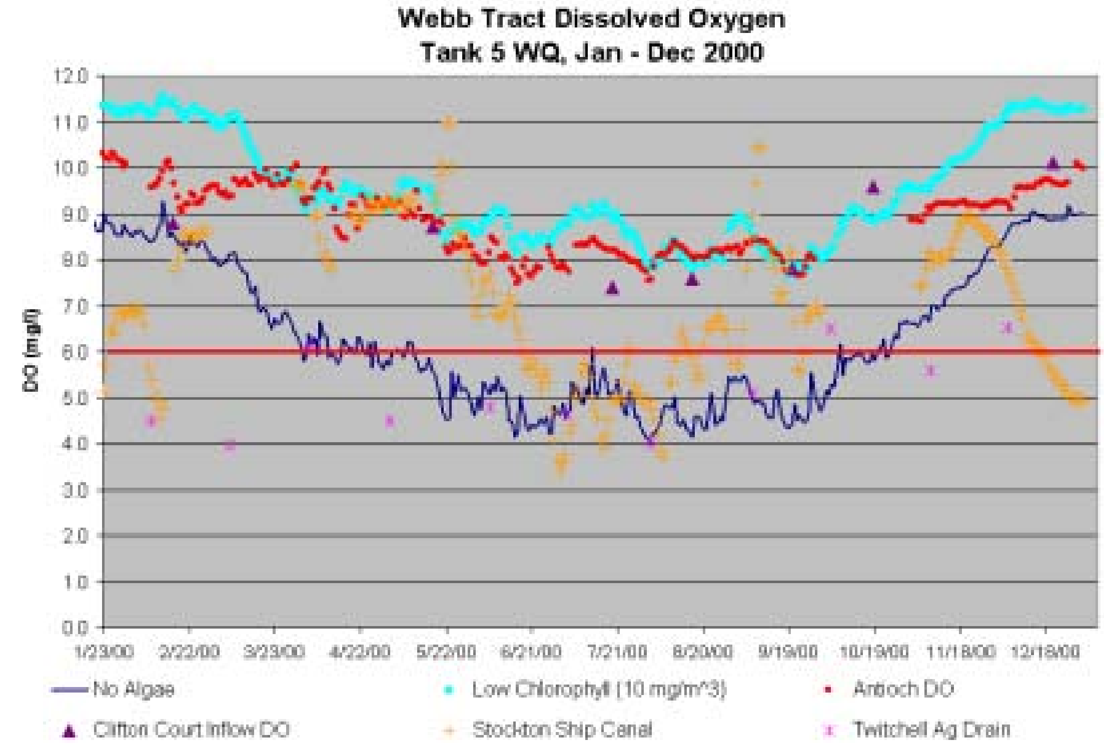



Figure 5-38 Bacon Island DO Plot, Tank 5 Water Quality for 2000

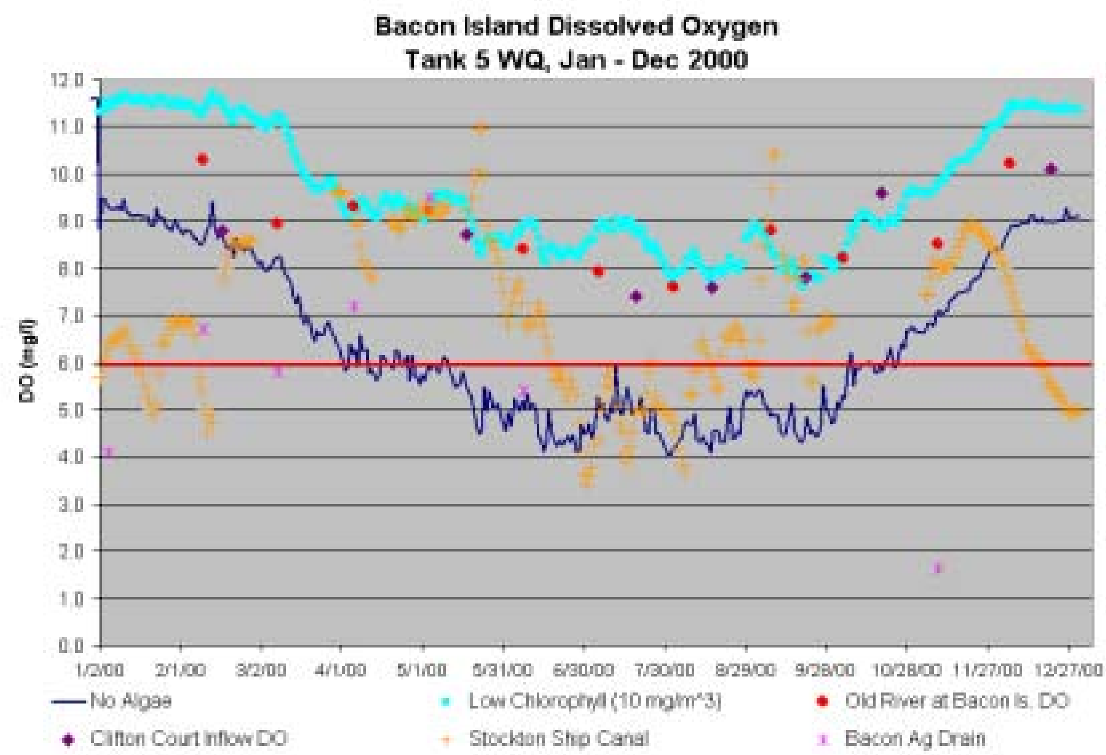


Figure 5-39 Webb Tract DO Plot, Tank 7 Water Quality for 2000

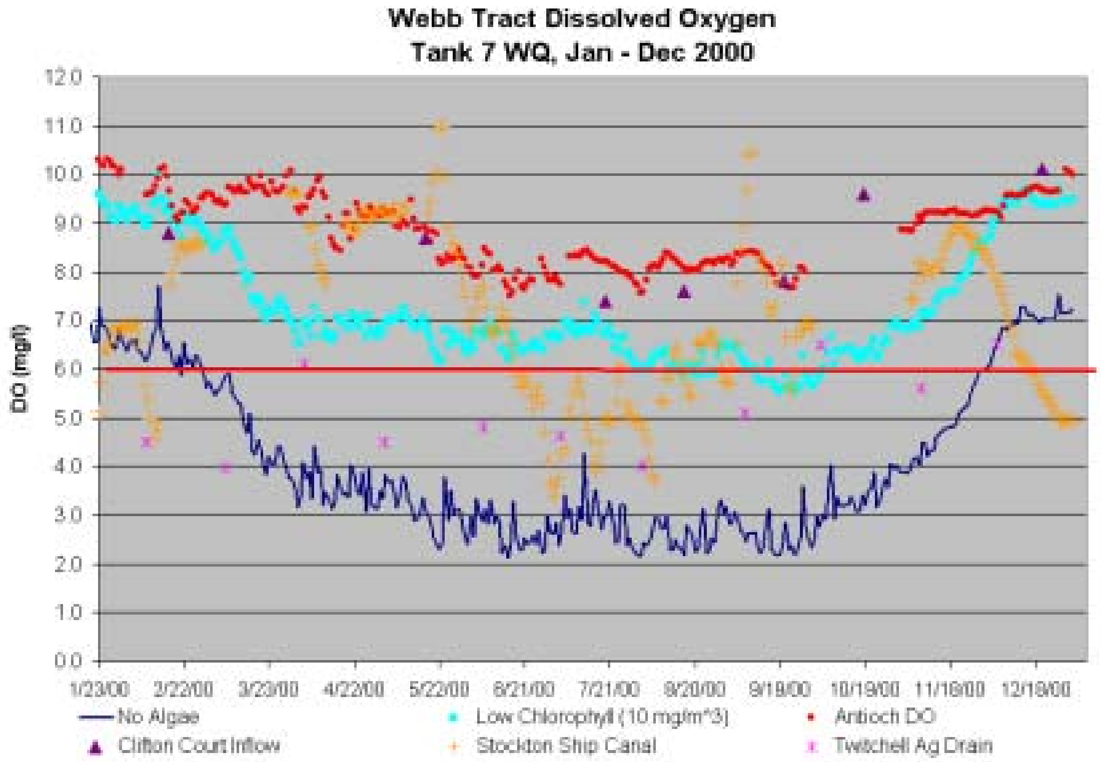



Figure 5-40 Bacon Island DO Plot, Tank 7 Water Quality for 2000

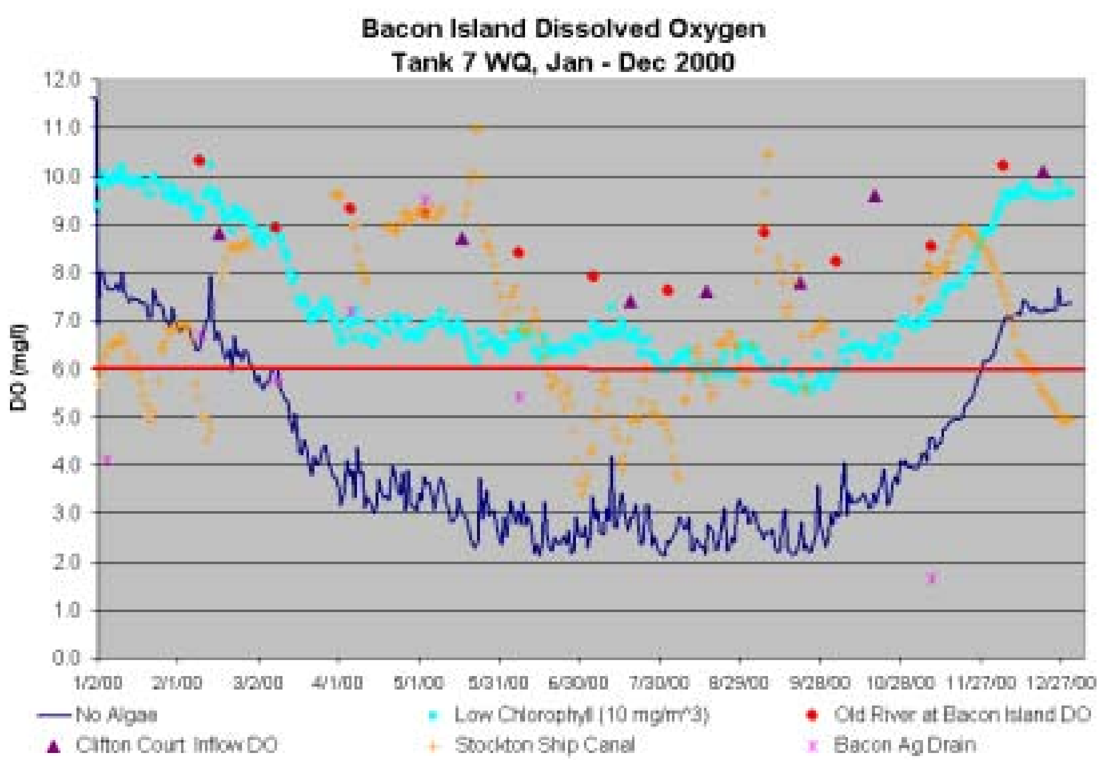


Figure 5-41  Webb Tract DO Mass Balance for Tank 5, No Algae, Year 2000

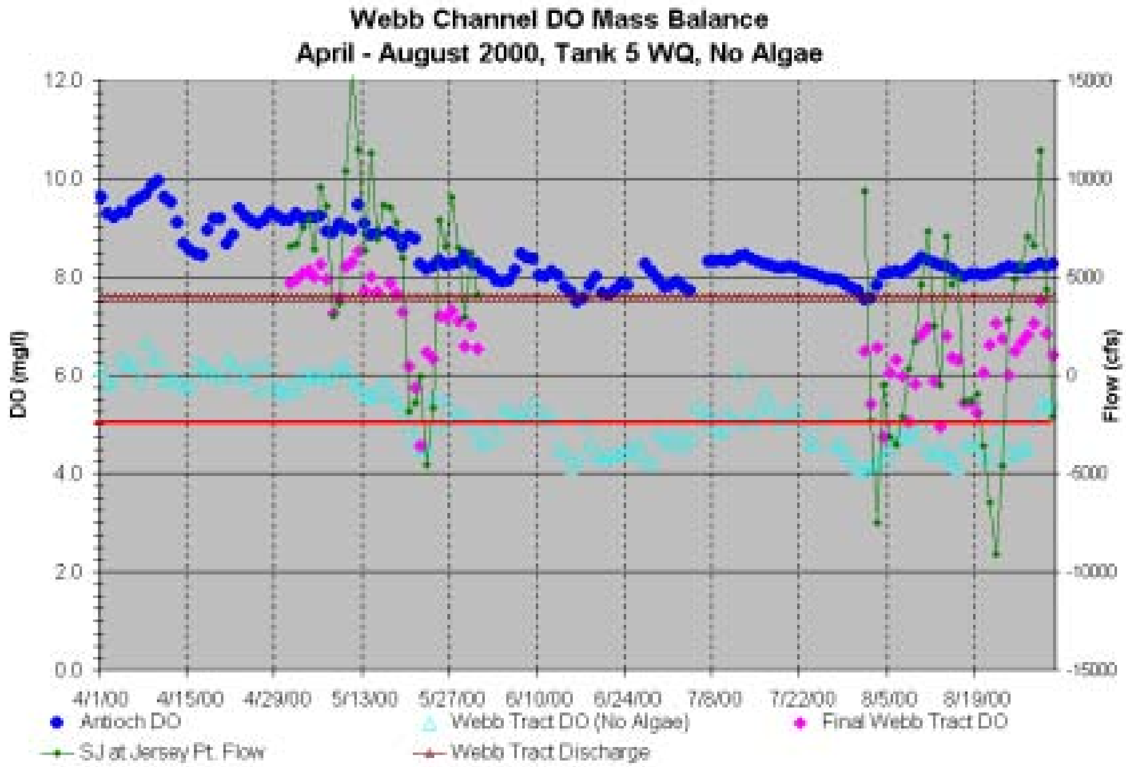



Figure 5-42  Webb Tract DO Mass Balance for Tank 5, Low Algae, Year 2000

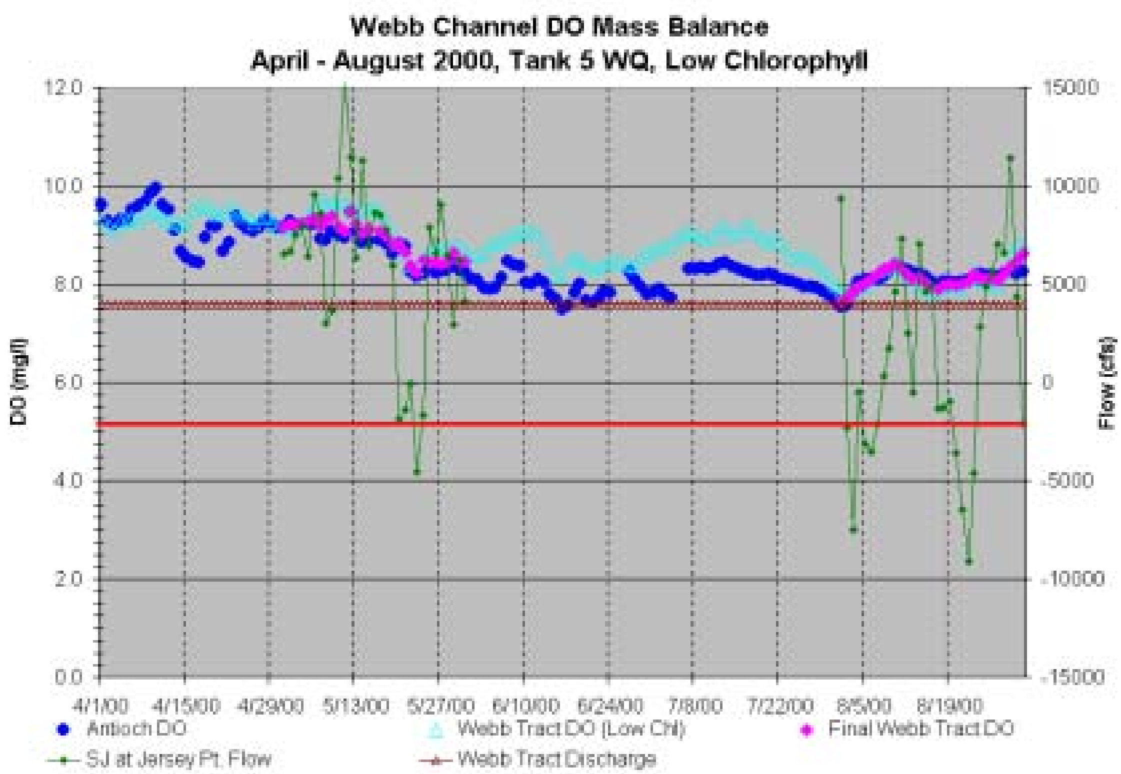


Figure 5-43  Webb Tract DO Mass Balance for Tank 7, No Algae, Year 2000

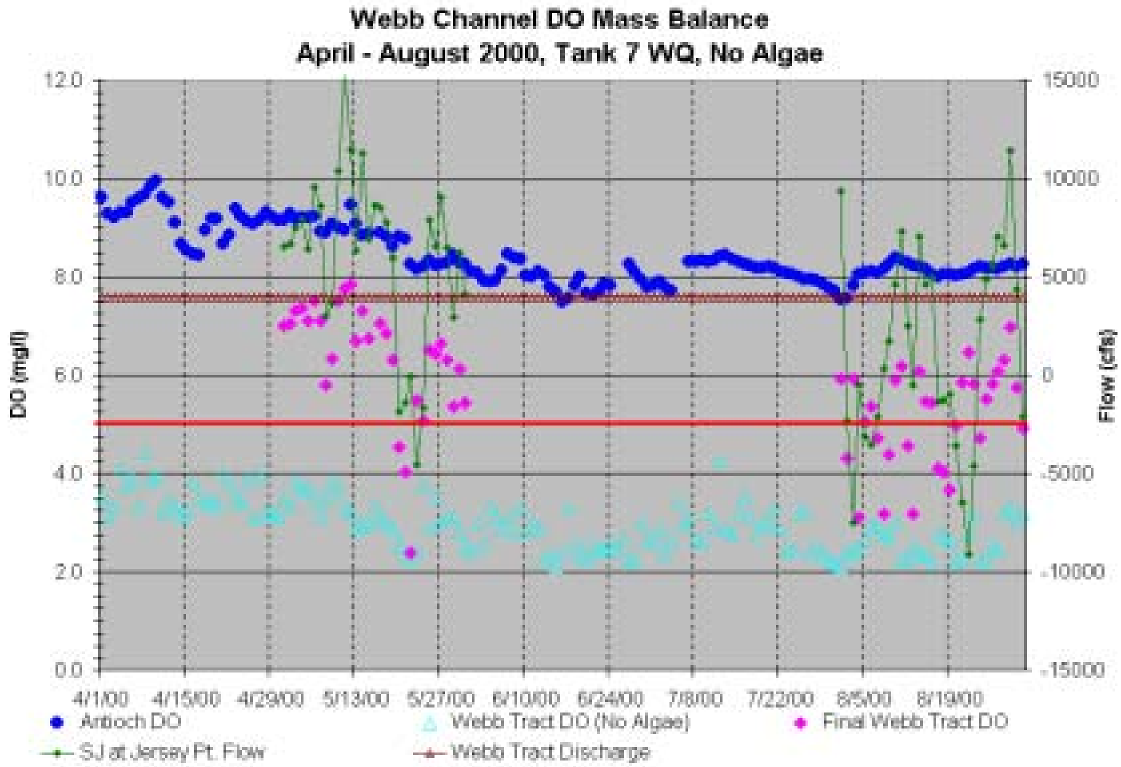



Figure 5-44  Webb Tract DO Mass Balance for Tank 7, Low Algae, Year 2000

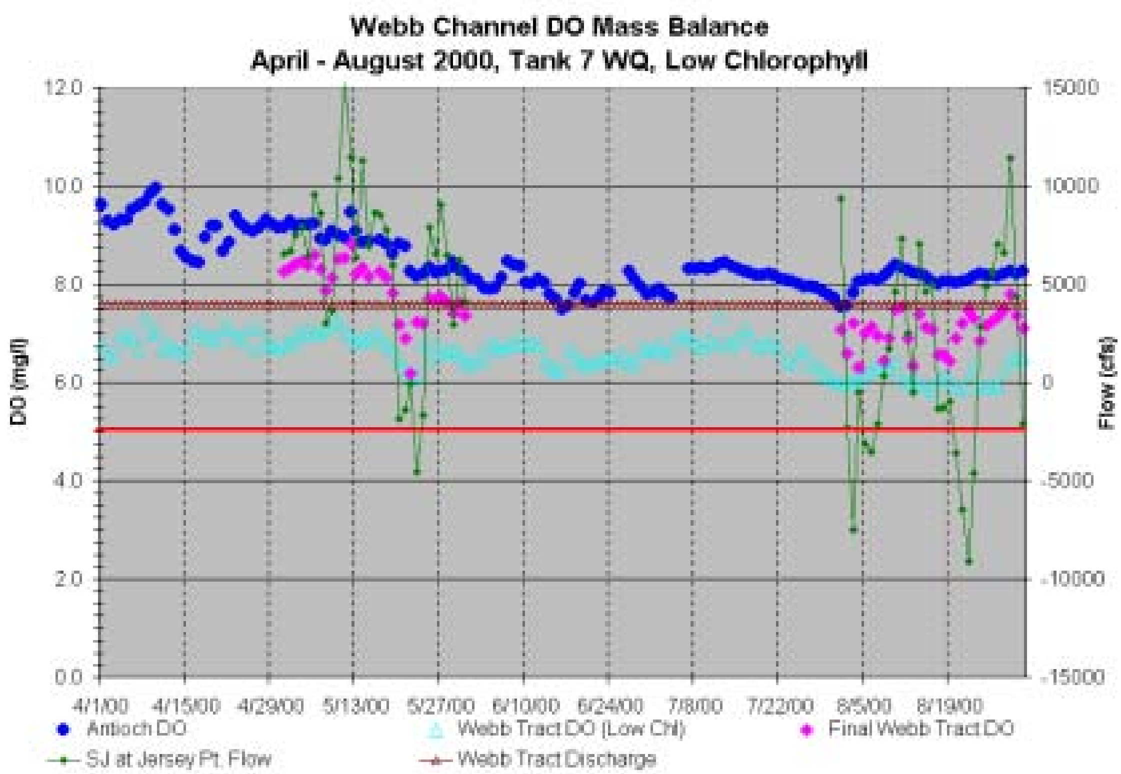


Figure 5-45 Bacon Island DO Mass Balance for Tank 5, No Algae, Year 2000

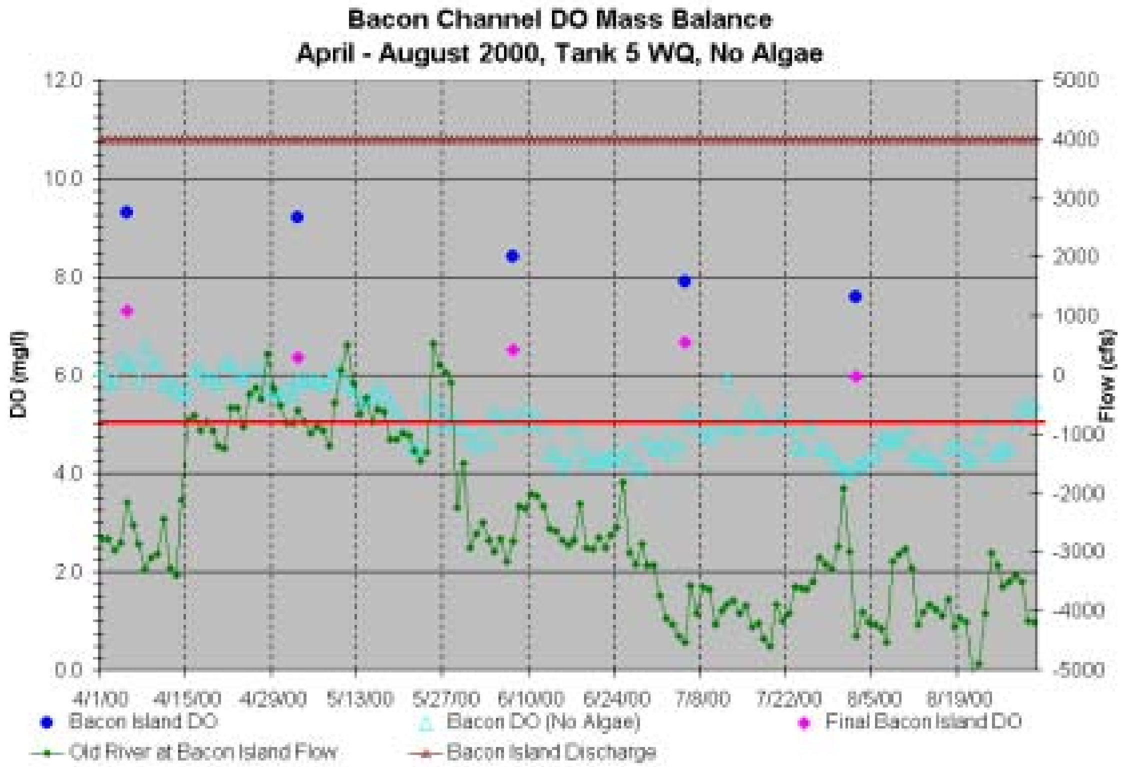



Figure 5-46 Bacon Island DO Mass Balance for Tank 5, Low Algae, Year 2000

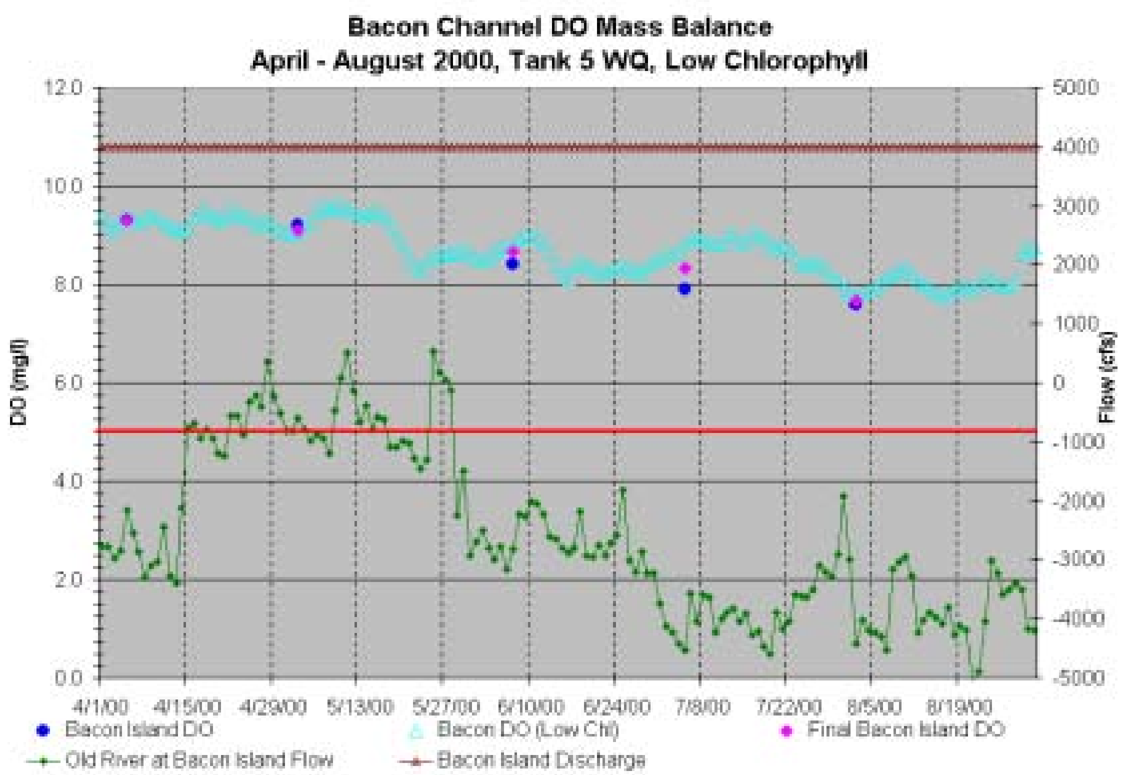


Figure 5-47 Bacon Island DO Mass Balance for Tank 7, No Algae, Year 2000

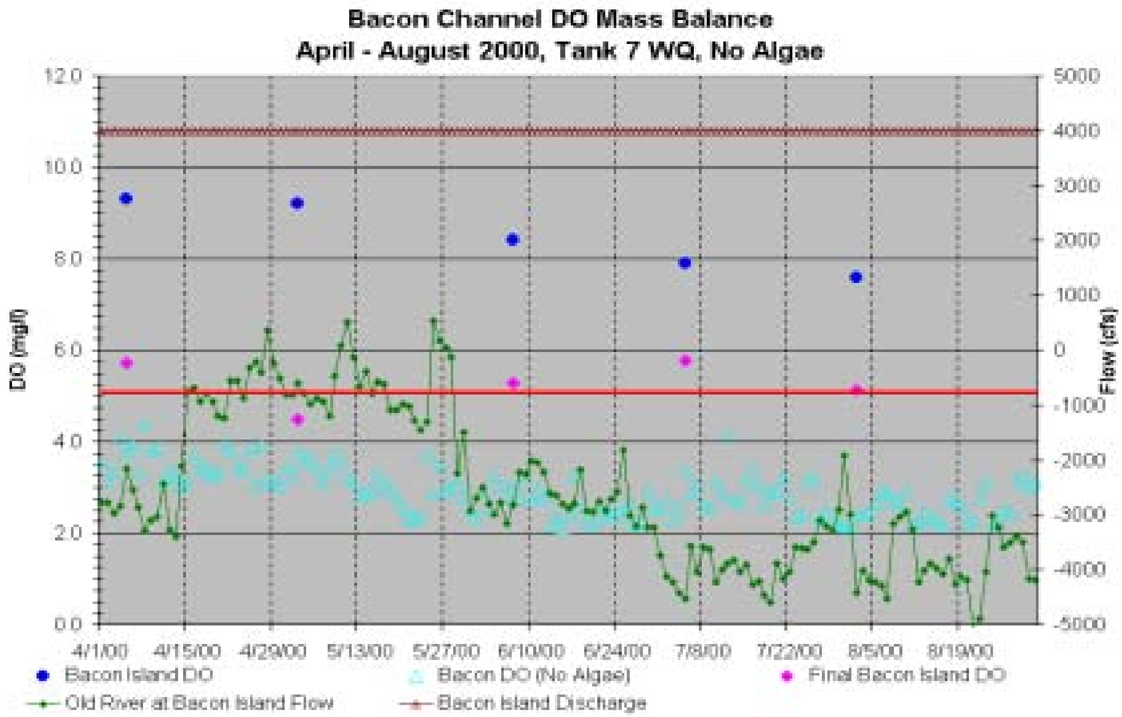
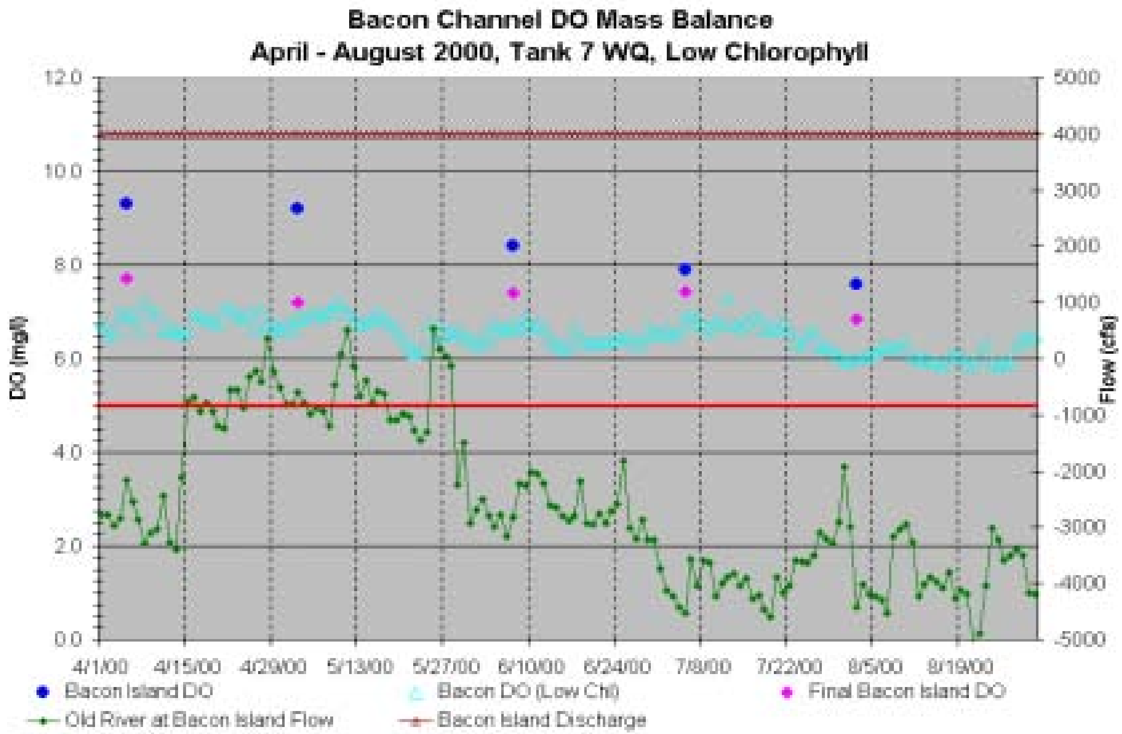



Figure 5-48 Bacon Island DO Mass Balance for Tank 7, Low Algae, Year 2000



APPENDIX 5A
DISSOLVED OXYGEN FIGURES

(1998-1999)

Figure 5A-1 Webb Tract DO Plot, Tank 5 Oxygen Demand for 1999

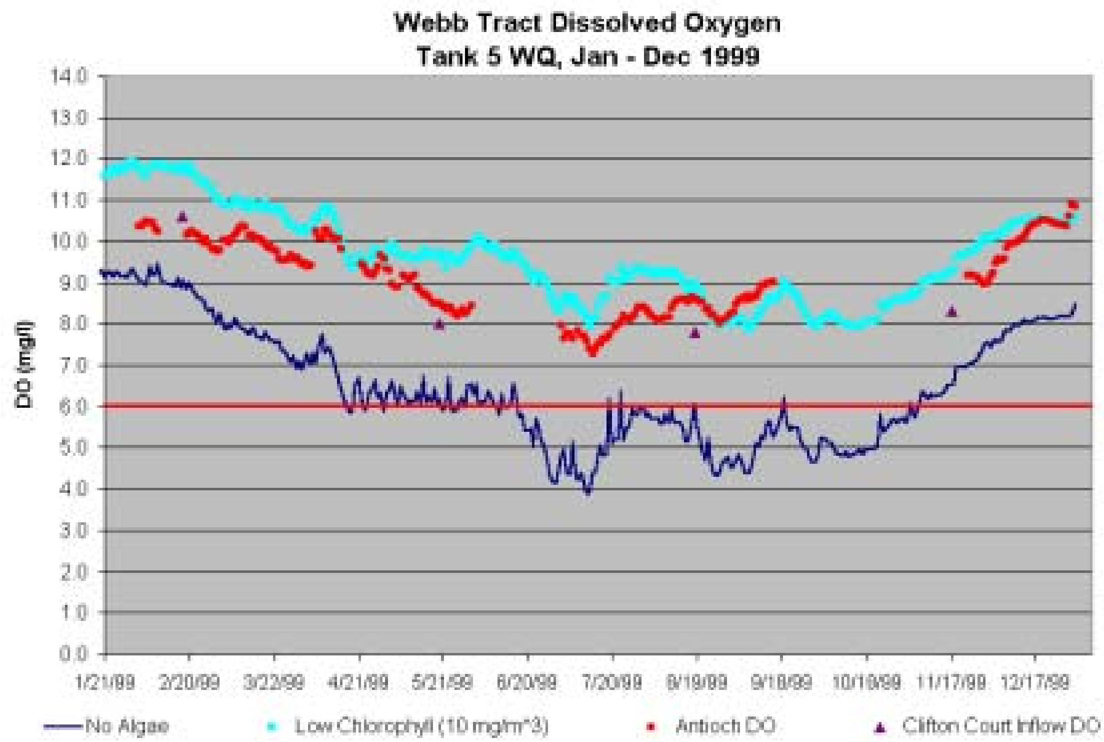


Figure 5A-2  Bacon Island DO Plot, Tank 5 Oxygen Demand for 1999

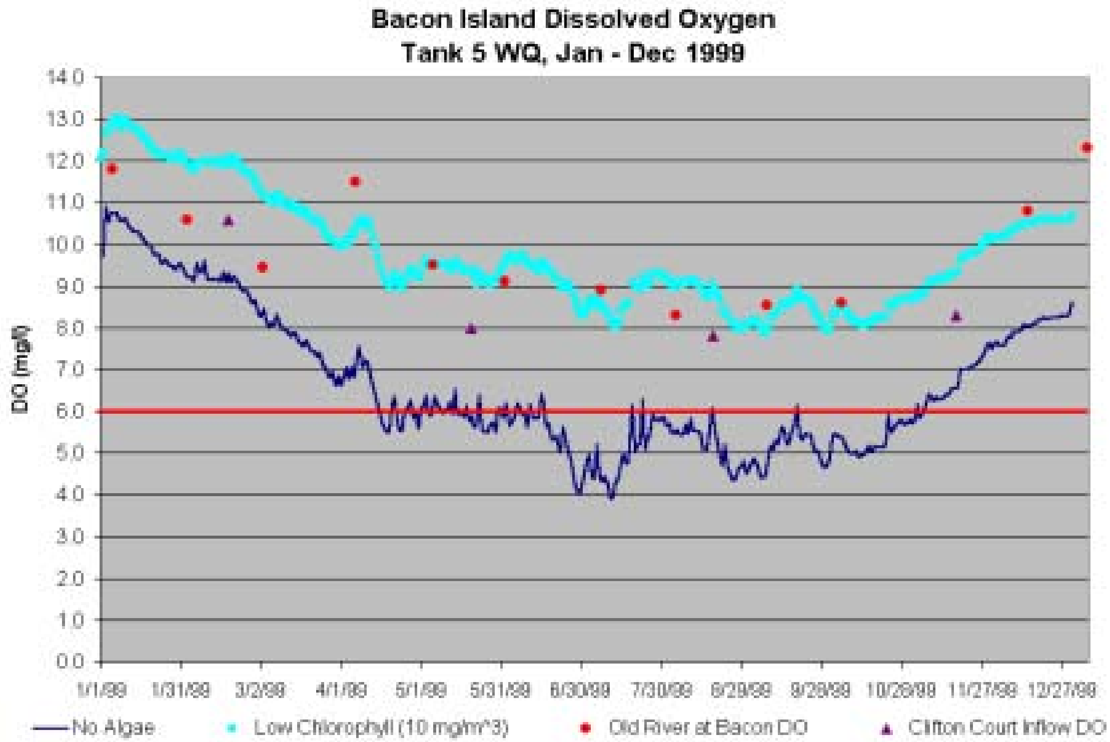



Figure 5A-3  Webb Tract DO Plot, Tank 7 Oxygen Demand for 1999

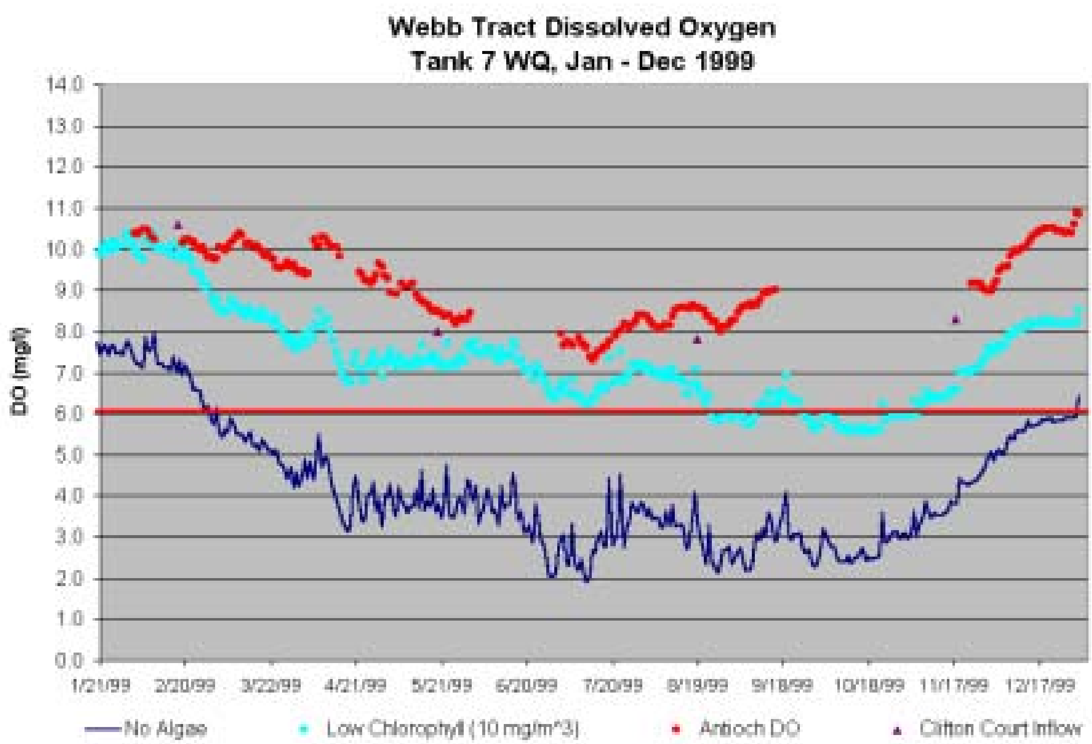


Figure 5A-4  Bacon Island DO Plot, Tank 7 Oxygen Demand for 1999

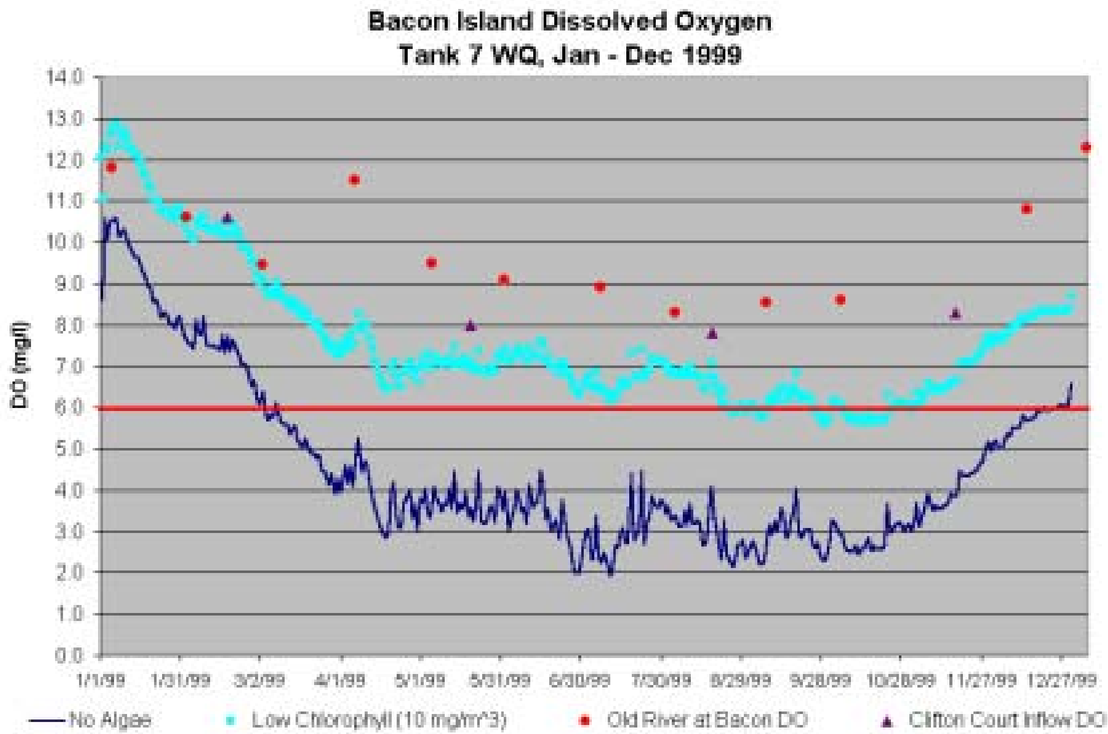



Figure 5A-5  Webb Tract DO Plot, Tank 5 Oxygen Demand for 1998

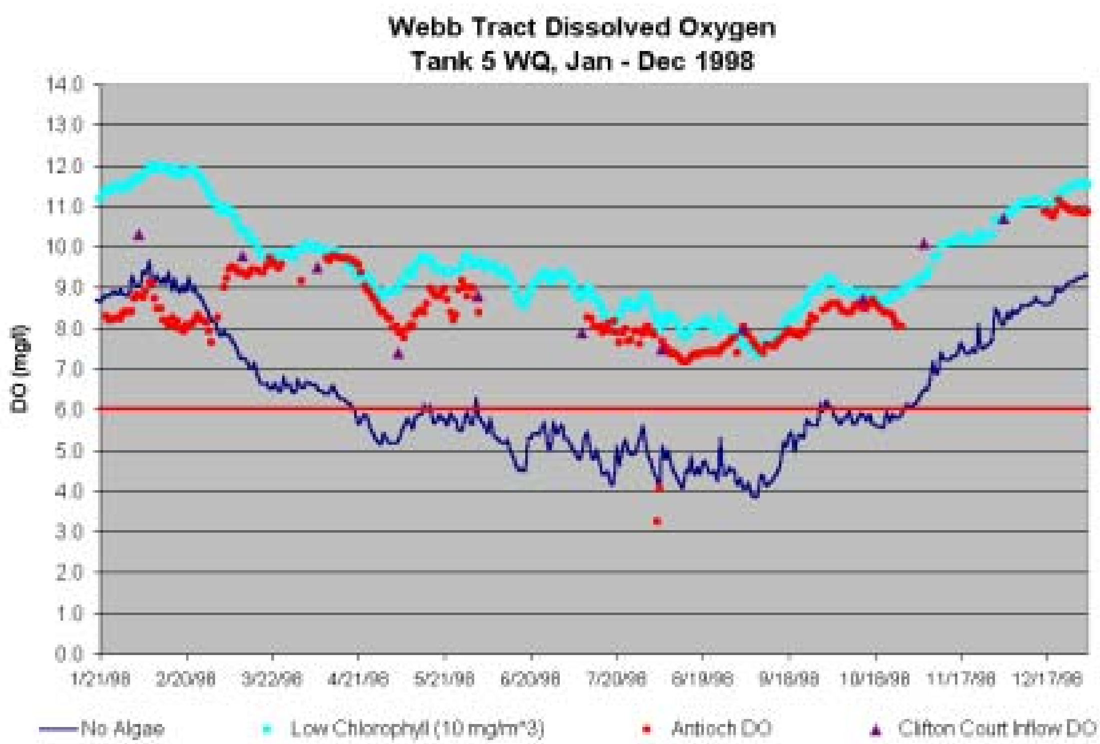


Figure 5A-6 Webb Tract DO Plot, Tank 7 Oxygen Demand for 1998

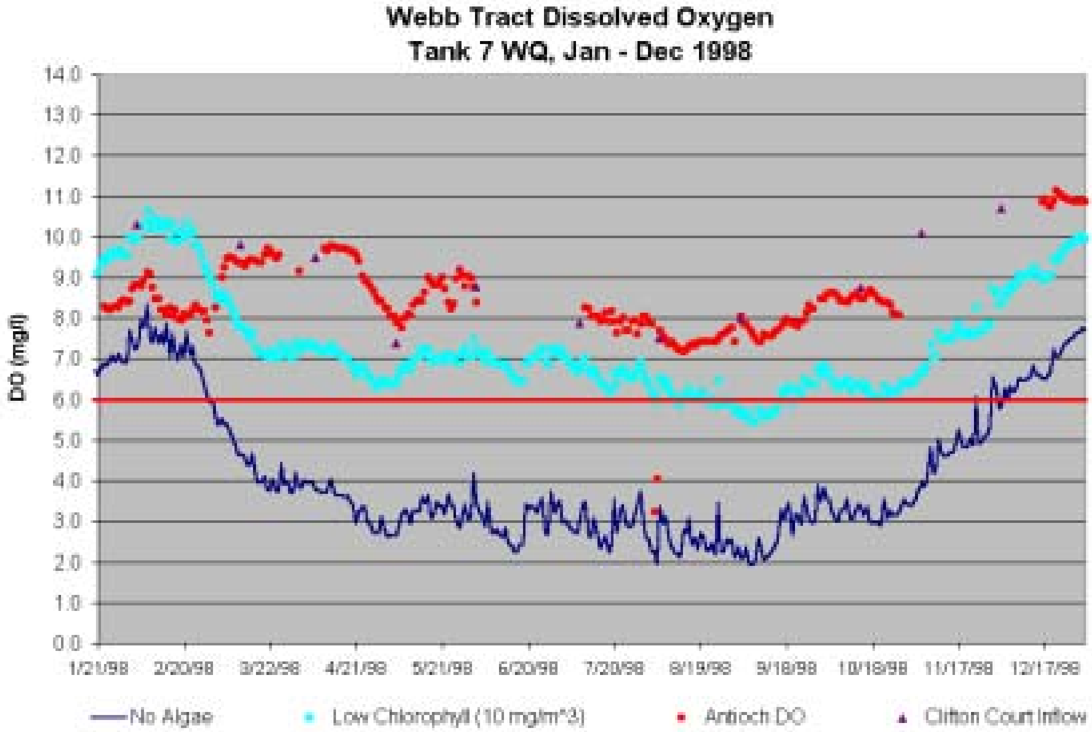



Figure 5A-7 Webb Tract DO Mass Balance for Tank 5, No Algae, Year 1999

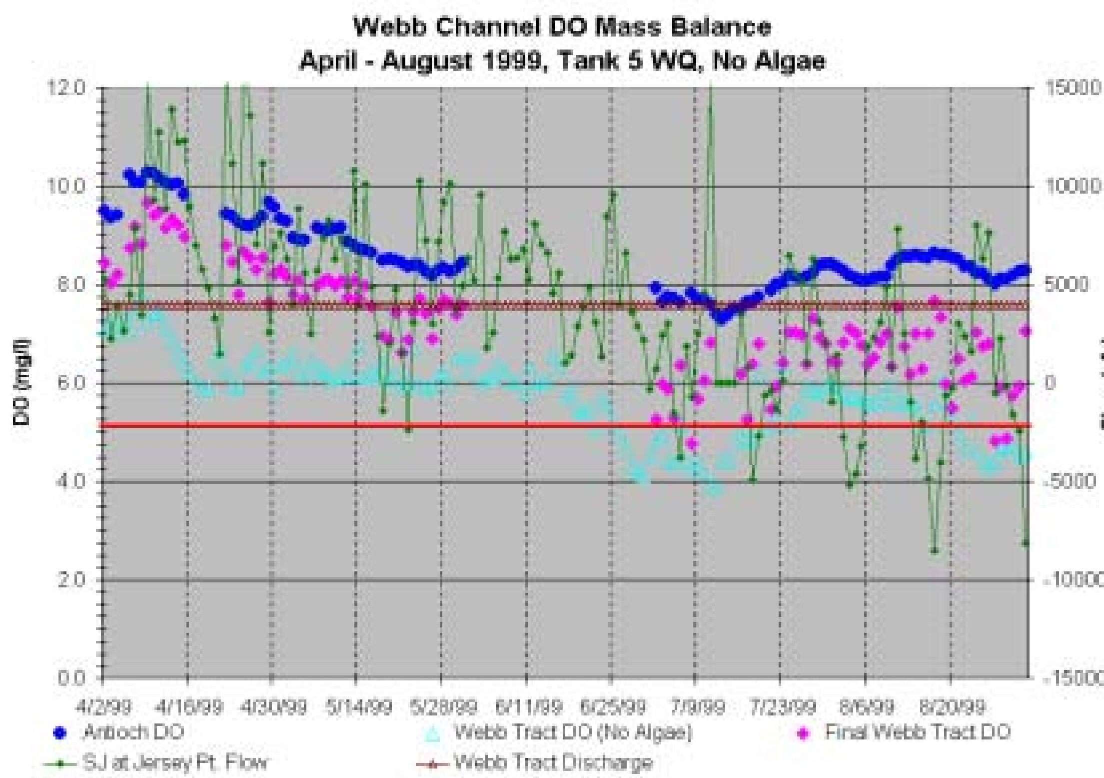


Figure 5A-8  Webb Tract DO Mass Balance for Tank 5, Low Algae, Year 1999

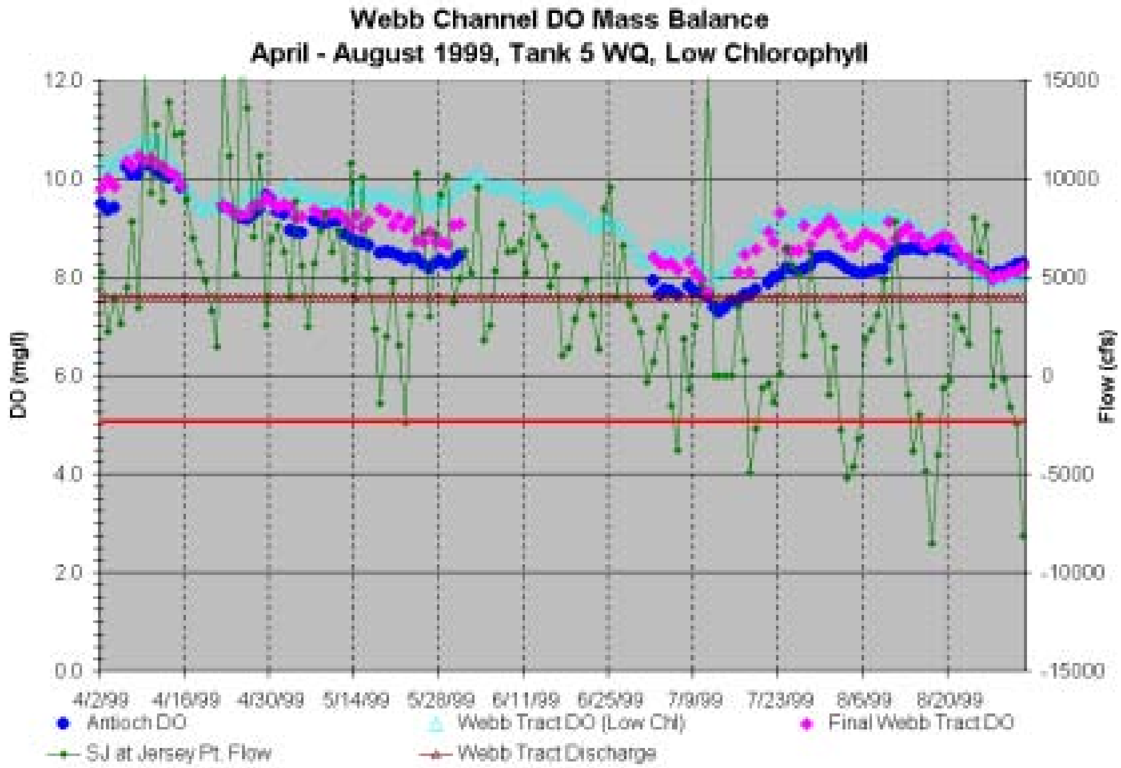



Figure 5A-9  Webb Tract DO Mass Balance for Tank 7, No Algae, Year 1999

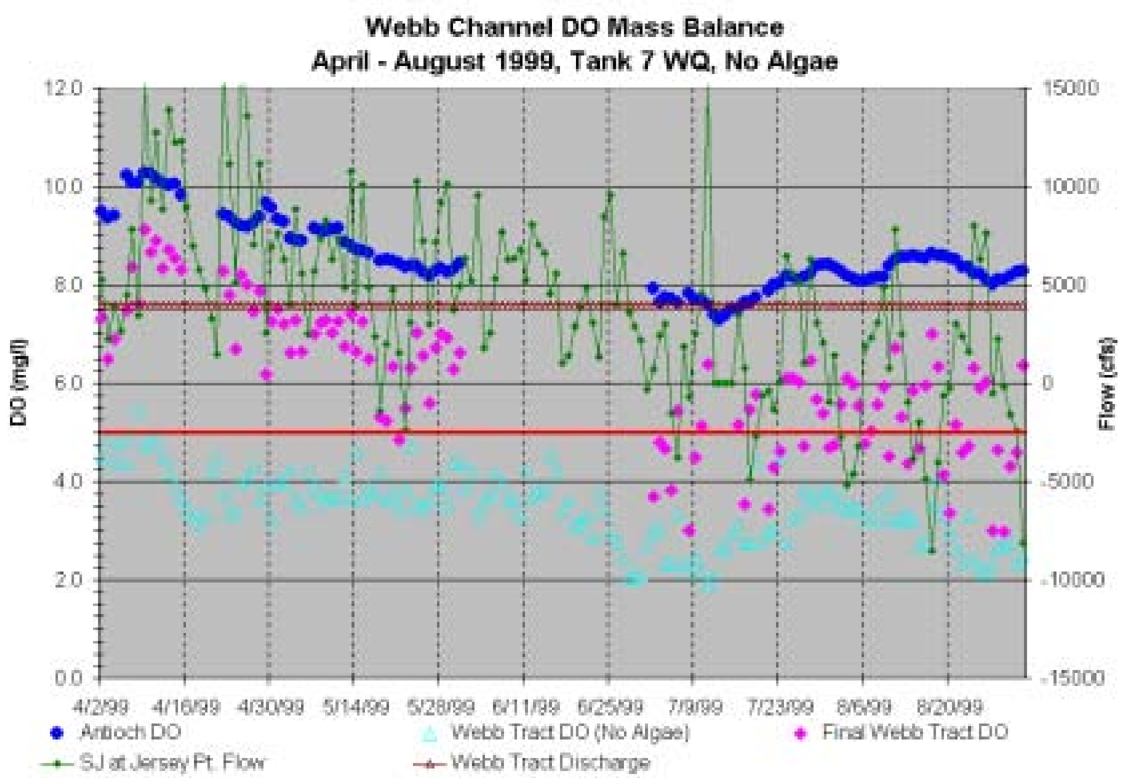


Figure 5A-10  Webb Tract DO Mass Balance for Tank 7, Low Algae, Year 1999

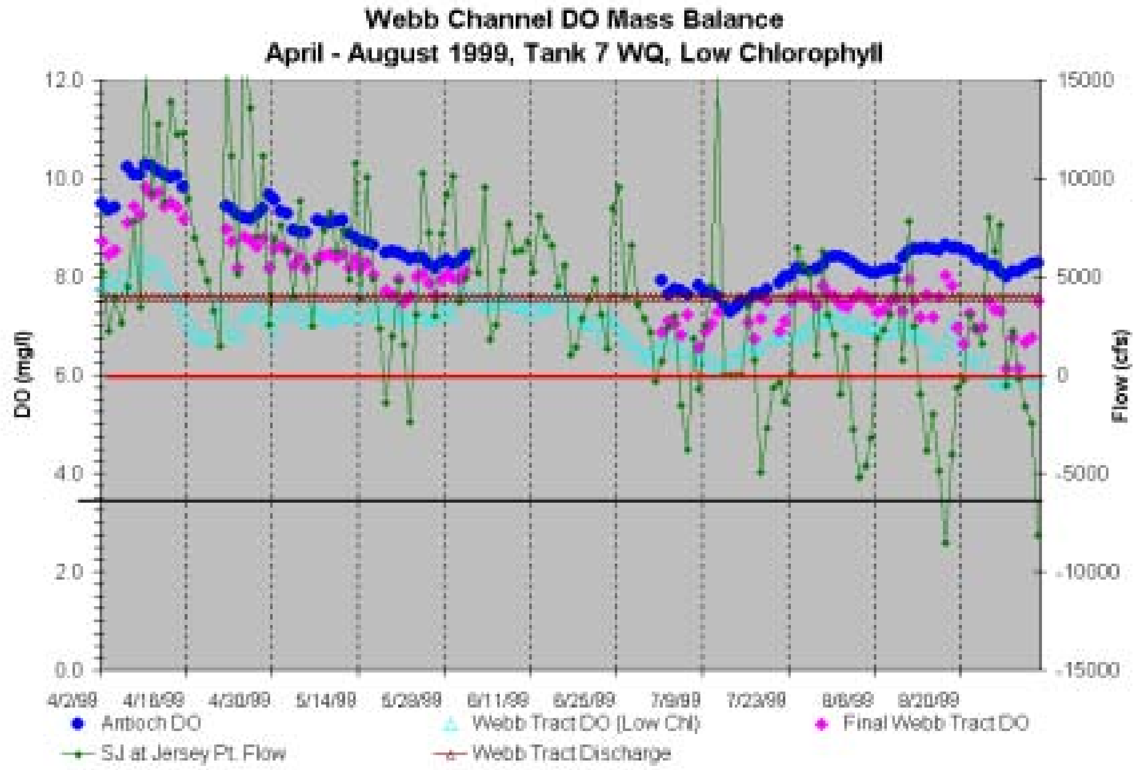



Figure 5A-11  Bacon Island DO Mass Balance for Tank 5, No Algae, Year 1999

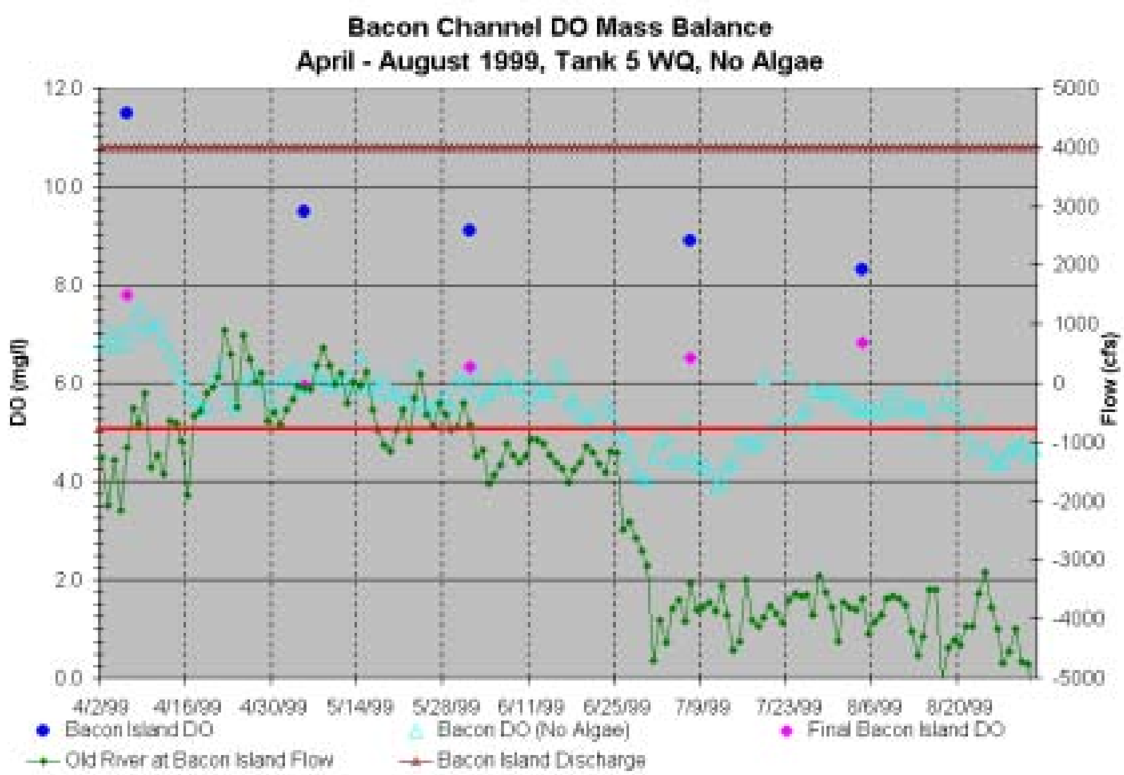


Figure 5A-12  Bacon Island DO Mass Balance for Tank 5, Low Algae, Year 1999

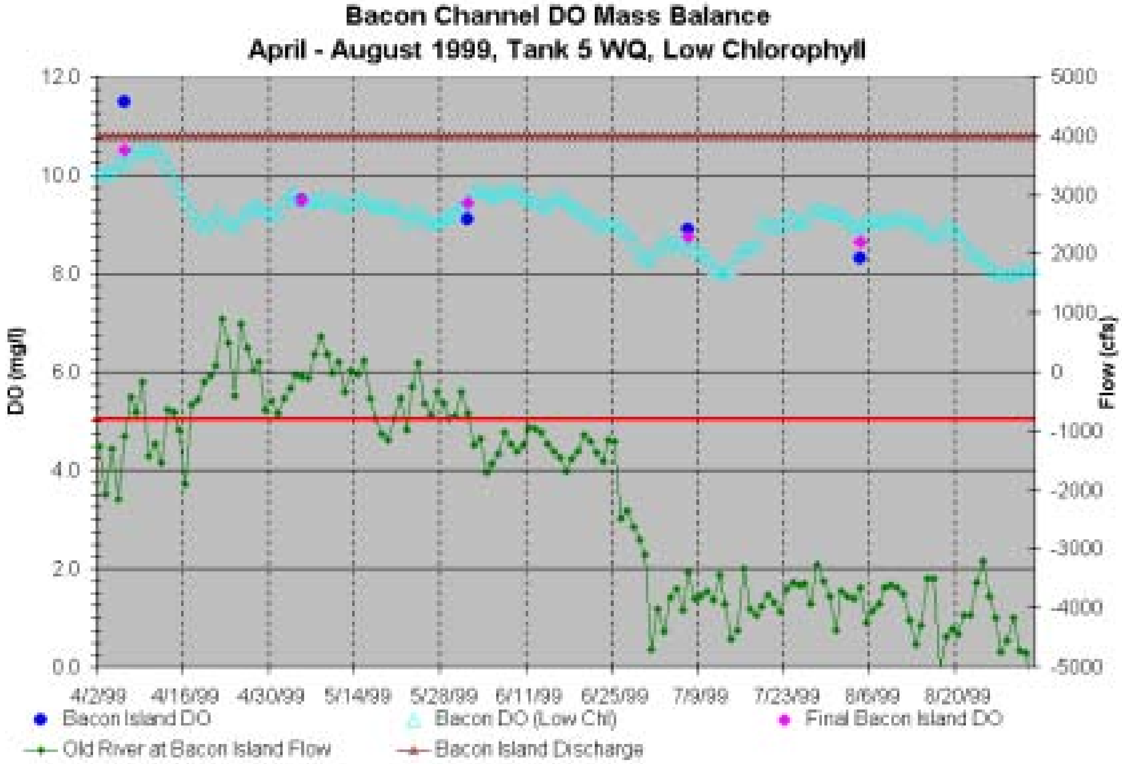



Figure 5A-13  Bacon Island DO Mass Balance for Tank 7, No Algae, Year 1999

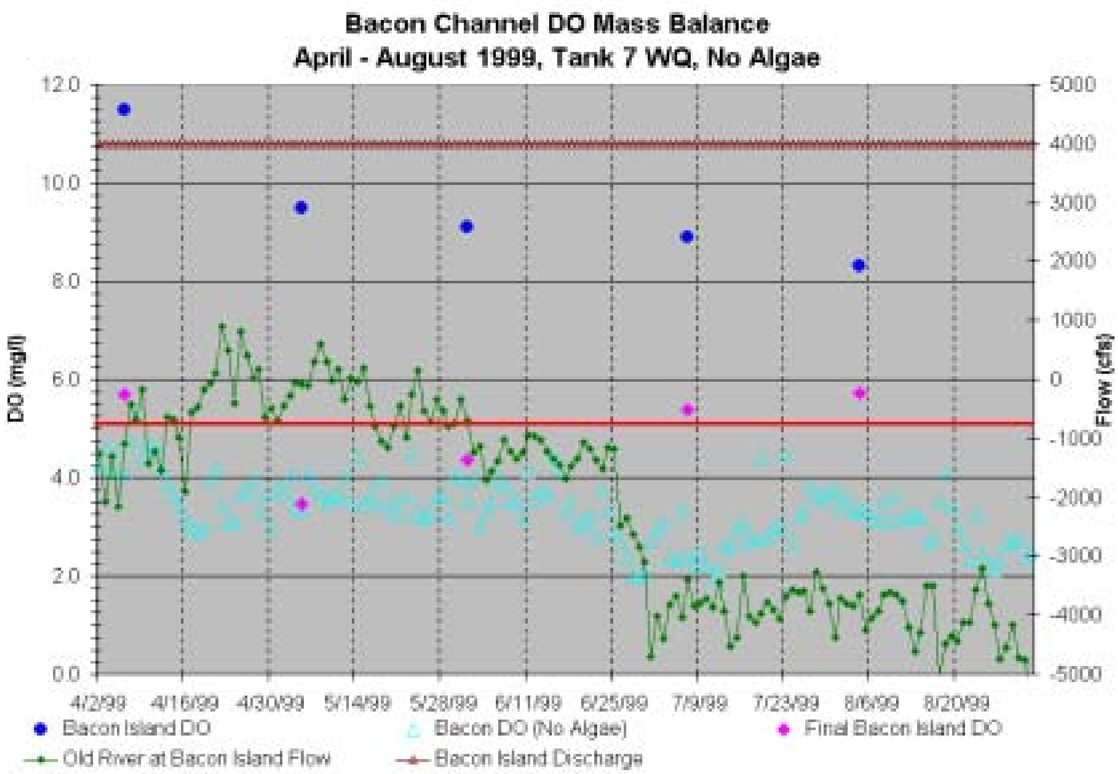


Figure 5A-14 Bacon Island DO Mass Balance for Tank 7, Low Algae, Year 1999

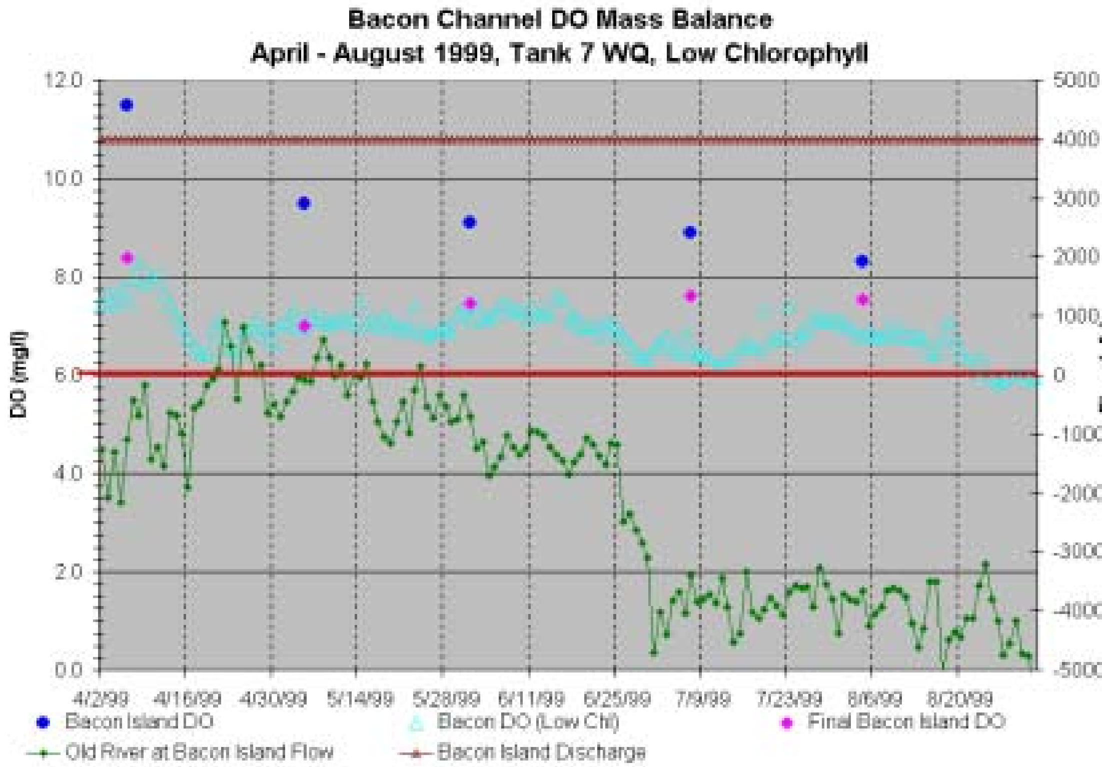



Figure 5A-15 Webb Tract DO Mass Balance for Tank 5, No Algae, Year 1998

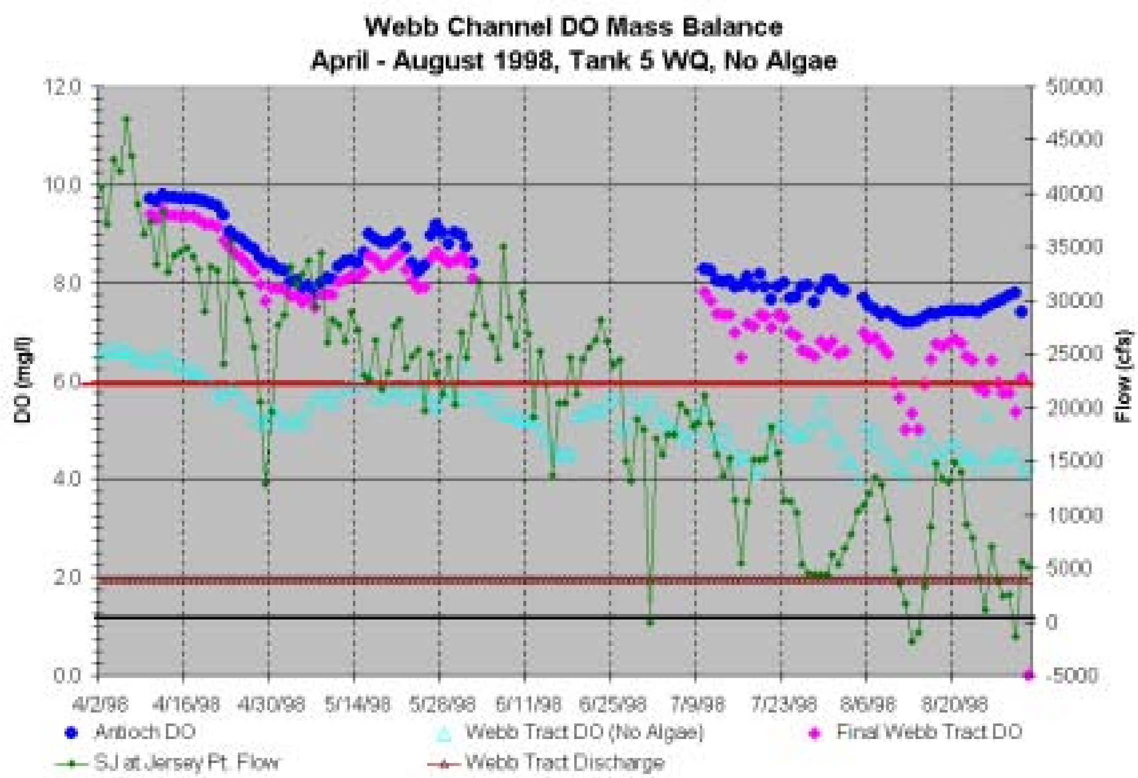


Figure 5A-16 Webb Tract DO Mass Balance for Tank 5, Low Algae, Year 1998

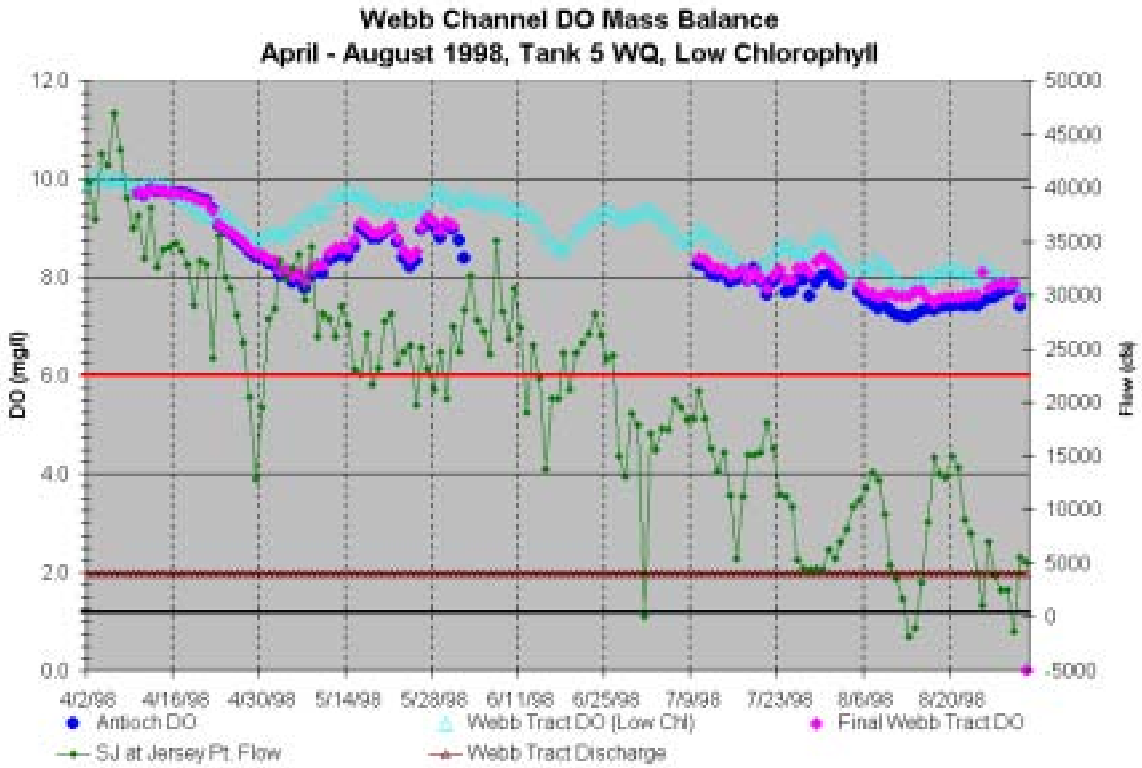



Figure 5A-17 Webb Tract DO Mass Balance for Tank 7, No Algae, Year 1998

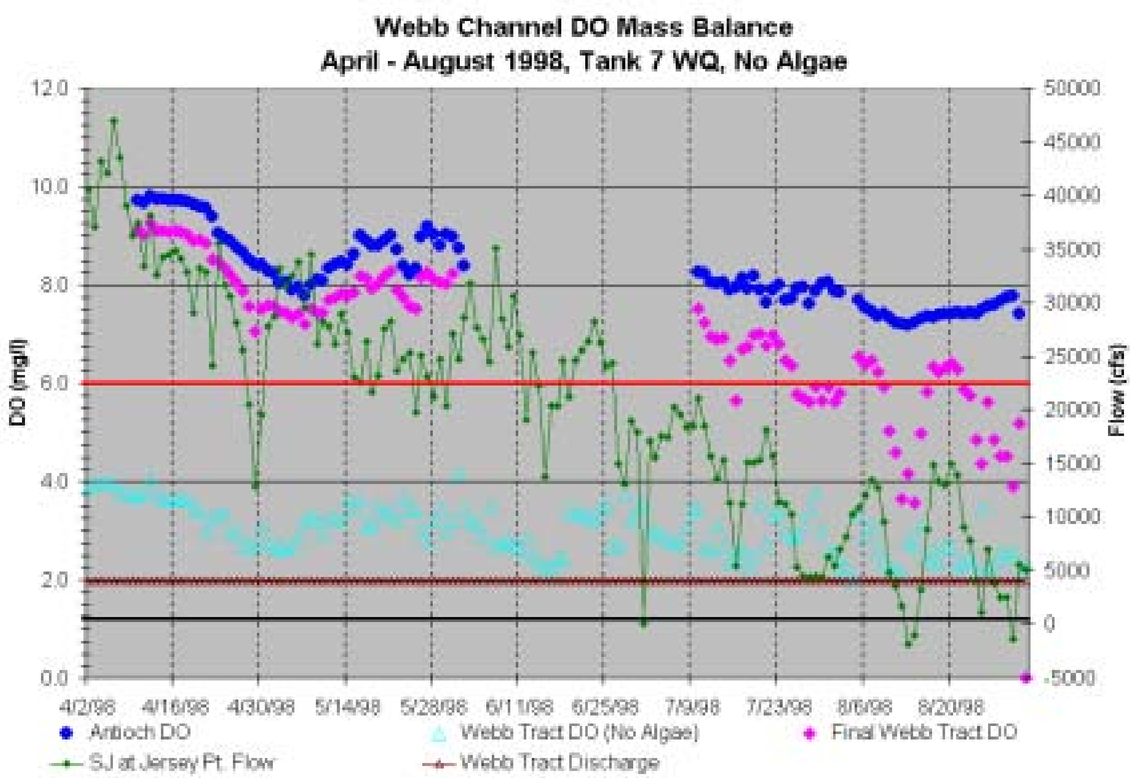


Figure 5A-18 Webb Tract DO Mass Balance for Tank 7, Low Algae, Year 1998